IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XIX APRIL 1940

GONÇALVES DA SILVA (S.). **A ferrugem do Pimentão.** [Chilli rust.]—*Biologico*, v, 11, pp. 253–254, 1939.

A semi-popular note is given on the rust of chillies (*Capsicum* spp.) in São Paulo and other parts of Brazil due to *Puccinia paulensis* [*R.A.M.*, xvii, p. 17], which forms its rust-coloured pustules on the leaves and branches, both the upper and under surfaces being involved in severe cases, as well as the petioles, peduncles of the fruits, and even the floral buds. In addition to cultural measures of control, including bi- to triennial crop rotation, the writer recommends fortnightly treatments of the plants with 1 per cent. Bordeaux mixture.

BAUDIN (J.). **Chronique. Traitements contre la chlorose. Traitement de l'excoriose.** [Current notes. Treatments against chlorosis. Treatment of excoriosis.]—*Progr. agric. vitic.*, cxii, 44, pp. 320–321, 1939.

To be effective, the treatment of vine chlorosis by swabbing the pruned stocks with iron sulphate [*R.A.M.*, xviii, p. 435] must be carried out immediately after pruning, in order that the chemical may be absorbed by the vine.

Excoriosis [*Phoma flaccida*: ibid., xvii, p. 372] is becoming increasingly prevalent in France. Control measures should be carried out in autumn, and should consist in pruning, followed by the immediate removal of the prunings, and spraying the branches and shoots (not the pruning wounds) with iron sulphate (30 to 35 per cent. solution, preferably with the addition of sulphuric acid at the rate of 1 in 100 by volume). A second spray treatment may sometimes be necessary; this should consist in an application of iron sulphate before vegetation starts or of an ordinary cupric mixture (3 or 4 per cent.) when vegetation begins.

BENNETT (F. T.). **Some past and present crop disease problems in the north of England.**—*Ann. appl. Biol.*, xxvi, 4, pp. 837–841, 1939.

Surveying the crop disease situation in the north of England the author states that control of club root of swedes (*Plasmodiophora brassicae*) [*R.A.M.*, xvi, p. 222; xvii, p. 283] by lime is adopted as a standard practice everywhere. On notoriously sour soils, however, this treatment is not economical. Attempts to find a variety of swedes resistant on badly contaminated marshy land in a wet season were unsuccessful, but under less severe conditions the varieties Bangholm and Wilhelmsburgher proved markedly resistant.

Dry rot of swedes (*Phoma lingam*) [ibid., xviii, p. 222], arising from a combination of infected seed and contaminated dung, has been so widespread and severe that some farms with short rotations had to abandon the crop on its account. When seed from two stocks of the same variety were grown alongside each other on a field which was not contaminated, one stock gave 60 and the other 1 per cent. of diseased roots, illustrating the possibility of losses from infected seed.

Boron-deficient soils do not occur uniformly in Cumberland, so that routine treatment against brown heart of swedes [ibid., xviii, p. 565] cannot be recommended. The condition is controlled by borax or boronated basic slag, at a cost of from 2*s.* 6*d.* to 3*s.* 6*d.* per acre, and by boronite at 11*s.* per acre.

A chlorotic condition of *Brassica* spp. resembling mosaic, but not, according to K. M. Smith, of virus nature, is stated to cause the dying-off of winter and spring greens under frost, and stunted heads in cauliflower and broccoli.

A form of grey leaf of oats [also known as grey speck: ibid., xix, p. 6] is reported to occur frequently in Cumberland on land suffering from colliery damage. Dressings of manganese sulphate often fail to control the trouble, and it is assumed that other factors are involved. The relative freedom from *Ophiobolus graminis* in the north is attributed to the combination of more or less acid soil, successively lower susceptibility of the kinds of cereals grown in succession, and green manuring by long leys.

Spraying against potato blight (*Phytophthora infestans*) is stated to be applied to a small extent only, as growers think it more economical to risk an occasional bad season than to spray every year. Seed potatoes are now grown in the Eden valley where soil and climate are specially suitable; they compare most favourably every year with the best of seed from elsewhere.

Perfect control of leek blight (*P. porri*) [ibid., xi, p. 151] is obtained by spraying with Bordeaux mixture.

Outstanding among the diseases of tomato is a root rot associated with a species of *Colletotrichum*.

Van Poeteren (N.). **Verslag over de werkzaamheden van den plantenziektenkundigen Dienst in het jaar 1938.** [Report on the work of the Phytopathological Service in the year 1938.]—*Versl. PlZiekt. Dienst Wageningen* 93, 92 pp., 11 figs., 1939.

The following are among the items of interest in this report, compiled on the usual lines [*R.A.M.*, xviii, p. 153]. The year 1938 was characterized by an exceptionally severe epidemic of yellow rust (*Puccinia glumarum*) of wheat, the Joncquois variety being particularly susceptible.

The beet crops sustained heavy and widespread damage from *Rhizoctonia violacea* [*Helicobasidium purpureum*: see below, p. 251], which can only be combated on a large scale by prophylactic cultural measures, notably a judicious crop rotation excluding from the immediate sequence not only beets but also such other hosts of the fungus as carrots, cabbages, rape [*Brassica napus* var. *oleifera*], clover, and lucerne.

Blue spotting of potatoes [ibid., vi, p. 632; xv, p. 526], which appears to be more prevalent than generally supposed, may easily be prevented by liberal applications of potash. 'Glassiness' [cf. ibid., xvi, p. 118] or 'iciness' of cut surfaces, a disorder of obscure origin presumably associated with adverse climatic conditions, caused heavy losses, a number of the affected crops being unsaleable. Eersteling [Duke of York] tubers with sunken, bluish patches round the 'eyes' gave rise to plants showing all the typical symptoms of stipple streak [ibid., xvi, p. 552], including the well-known brown spots surrounding the 'eyes'.

A species of *Fusarium* was isolated from reddish, sunken lesions on freesia bulbs [ibid., xiii, p. 101], the discoloration in some cases extending far into the tissues. Diseased bulbs were either a complete failure or produced sickly plants which soon turned yellow and died. For some years freesias have also suffered from a physiological disease which was particularly severe in 1938. The bulbs of affected plants appear quite sound, but above the root-collar a long, brown lesion develops, softening the tissues and causing collapse of the leaflets; no flowers are produced. The disturbance is tentatively ascribed to defective cultivation, and suggestions are made for remedying the trouble by improvements in the environmental conditions of the plants. Freesias, especially the coloured hybrid varieties raised from bulbs, are also liable to severe mosaic infection, Buttercup, Apotheosis, and Wistaria being specially susceptible. *Colchicum* smut [*Urocystis colchici*: ibid., xvi, p. 837] was unusually prevalent in 1938, *C. bornmülleri*, *C. autumnale*, and Lilac Wonder suffering particularly severe injury. The dark-coloured spores are ordinarily confined to the leathery exterior of the bulb and the outer surface of the inner white tissues, but on occasion they may penetrate deeply inwards. During growth the leaves may be covered with the spores, arranged in longitudinal rows and sometimes extending right down to the bulb. Among the more promising of the various substances tested for the control of tulip blight (*Botrytis tulipae*) [ibid., xviii, pp. 30, 129, 712, 726] were shirlan A.G. (1·2 and 0·6 per cent.), tulisan (1, 0·8, and 0·5 per cent.), and Wacker's kupferkalk [ibid., xvi, p. 230].

Some of the teleutospores of rose rust (*Phragmidium subcorticium*) [*P. mucronatum*: ibid., xviii, p. 184] on leaves from Aalsmeer failed to develop owing to infection by an undetermined species of *Fusarium*, a phenomenon not previously observed in Holland.

Armillaria mellea was very troublesome during 1938, not only on privet [ibid., xvi, p. 215], a very susceptible host, but also on oaks [loc. cit.], beeches [ibid., x, p. 698], and conifers. The spread of the fungus from neglected woods to cultivated plantings is effected by spores as well as by rhizomorphs, the former having been responsible for the infection of a 24-year-old Virginia creeper at Wageningen.

Notes are given on the potato blight (*Phytophthora*) [*infestans*] spray warning service [ibid., xiv, p. 13] and the testing of various fungicides.

Pole Evans (I. B.). **Annual Report of the Division of Plant Industry for the year ended 31st August, 1939.**—*Fmg S. Afr.*, xiv, 165, pp. 520–540, 16 figs., 1939.

The section of this report dealing with plant pathology (pp. 539–549)

in South Africa [cf. *R.A.M.*, xviii, p. 437] contains, among others, the following items of phytopathological interest. No citrus canker [*Pseudomonas citri*: loc. cit.] has been recorded in the Union for nine years, and all restrictions on the planting of citrus in areas hitherto quarantined have now been removed. Studies on citrus dry root rot [cf. ibid., xiii, p. 356] indicated that in well-drained, aerated soil, over-irrigation does not increase incidence if the soil fertility is maintained, but that if soil fertility is not maintained over-irrigation may induce chlorosis, severe defoliation, and die-back.

Evidence was obtained that groundnut leaf spot in the northern Transvaal is due to only one species of *Cercospora*, viz., *C. personata* [ibid., xvii, p. 442]. In some parts of the northern Transvaal rotting of groundnut stems, nuts, and peduncles was very prevalent, causing 5 to 70 per cent. loss in individual crops. Extensive isolations from all affected parts of plants from various localities invariably gave *Sclerotium rolfsii* [loc. cit.; ibid., xviii, p. 788]. In South Africa the disease never attacks the roots. In several groundnut crops the kernels failed to develop, or only partially developed; no one organism appeared to be constantly associated with the condition, but soil saprophytes such as *Rhizopus nigricans*, *Aspergillus niger*, and *Penicillium glaucum* were present in affected material, and the trouble was attributed to unfavourable climatic or soil conditions.

The *Pestalozzia* associated with the ripe rot of litchi [*Nephelium litchi*] fruits [ibid., xviii, p. 438] was isolated from fruits in all stages of growth, indicating that some infection, at least, occurs during or just after flowering. As one-year-old, dried-out cultures of the *Pestalozzia* were easily revived by transferring spores to fresh media, the fungus appears to be highly resistant to desiccation and other unfavourable conditions.

Pineapple fruits in eastern Cape Province were affected by typical black spot due to *Penicillium* spp., a wedge-shaped black spot not previously studied and due possibly to a mixture of *Penicillium* and *Fusarium*, and by a soft, light brown, somewhat translucent spotting due to *Fusarium* sp.

Tomato losses due to *F.* [*bulbigenum* var.] *lycopersici* [ibid., xvi, p. 367; xviii, p. 788] remain considerable. Preliminary pot tests and one field experiment indicated that soil treatment with calcium cyanamide was of marked value in control and also promoted excellent growth.

Investigations into a black spot of papaw apparently new to South Africa indicated that it is probably the same as the disease reported by Hopkins from Southern Rhodesia as due to *Phoma caricina* [ibid., xvii, p. 611].

Tobacco leaf curl [ibid., xvi, p. 367] caused heavy losses in certain localities, some growers neglecting to remove old stumps after picking, though if this precaution is taken the disease can be practically eliminated. Legislation providing a close season for tobacco is very desirable [cf. next abstract]. On some land, tobacco 'kromnek' [cf. ibid., xv, pp. 425, 687; xvii, p. 442] caused serious losses, but several growers who put into practice the official recommendations reported a considerable reduction in the disease.

Of a total of 311,231 citrus trees examined, 48 were affected by scaly

bark [psorosis: ibid., xix, p. 86], of which 31 were in the Rustenburg area. Growers were notified that they must destroy affected trees.

New records included sugar-cane rust (probably *Puccinia kuehnii*) [ibid., xviii, p. 626], gladiolus smut [*Urocystis gladioli*: ibid., xviii, pp. 33, 139], phlox leaf spot (*Septoria drummondii*) [ibid., xvii, p. 374], and internal dry rot of granadilla fruits [*Passiflora edulis*] caused by *Fusarium oxysporum*.

HOPKINS (J. C. F.). **Recent advances in plant pathology in Southern Rhodesia.**—*Proc. Rhod. sci. Ass.*, xxxvii, pp. 25–28, 1939.

In this review of recent advances in plant pathology in Southern Rhodesia with special reference to disease control, the author, after dealing with the control of tobacco diseases by spraying both in the seed-bed and the field [*R.A.M.*, xviii, p. 483], states that leaf curl [ibid., xviii, p. 632], has now become of minor importance as a result of legislation enforcing a close season in which no tobacco is allowed to grow and the infected white flies [*Bemisia* sp.] die off before the new crop is sown.

Most of the breakdown among apples in local storage was found to be due to canker (*Botryosphaeria ribis chromogena*) [ibid., xviii, p. 784], infection being set up by spores discharged from diseased parts of the trees. The disease was almost eliminated from affected orchards by the excision and destruction of the cankered bark and branches. Fruit trees at Rusapi apparently dying owing to attack by little leaf [ibid., xviii, pp. 187, 261] were stimulated to new growth by applications of sprays containing zinc sulphate.

Except in winter, it is almost impossible to grow the best marrowfat peas locally, owing to infection by mildew [*Erysiphe polygoni*: ibid., viii, p. 485], but selection of resistant types has yielded several promising strains. Damping-off of various plants has been virtually eliminated by sprinkling the soil with Bordeaux powder after sowing and foot rots of transplants may be similarly prevented by sprinkling dust round each stem.

Report of the Waite Research Institute, Glen Osmond, South Australia, 1937–1938.—x + 120 pp., 3 pl., 2 figs., 5 graphs, 1 map, 1939.

In the section of this report [cf. *R.A.M.*, xvi, p. 516] dealing with plant-pathological work in South Australia (pp. 35–40) it is stated that during the period under review tomatoes were reported for the first time locally to be attacked by *Aplanobacter michiganense* [ibid., xviii, pp. 279, 765]. *Botryosphaeria dothidea* [ibid., xii, p. 447] is recorded causing a scab on briar rose canes, and *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: ibid., xvii, p. 600] produced a canker at the point of budding on roses. *Boronia spinescens* was attacked by rust (*Puccinia boroniae*) [ibid., xii, p. 97]. During the last three years, celery pink rot (*Sclerotinia sclerotiorum*) [ibid., xviii, p. 789] has become increasingly prevalent, partly owing to unsatisfactory disposal of infected debris and partly owing to the short rotational system practised locally. Cauliflower leaf spot (*Cylindrosporium concentricum*) [ibid., xviii, p. 654] was observed for the first time; discoloured patches were produced on the curd, reducing the market value of the affected plants. *Stereum sanguinolentum* [ibid., xviii, pp. 361, 559, 564] was common

on the forest floor and was found on standing diseased *Pinus radiata* in a forest plantation. *Ophiobolus graminis* [ibid., xviii, p. 656], *Rhizoctonia* [*Corticium*] *solani*, *Fusarium* spp., and *Helminthosporium sativum* were present, separately and together, on wheat affected by root disease, the evidence indicating that *O. graminis* is of particular importance in this connexion. Old-established vines of wine-variety grapes near Adelaide are affected by a condition resembling court-noué [ibid., xvii, p. 96]. The symptoms become most conspicuous in spring, and are usually confined to the shoots of one arm. The affected shoots are greatly shortened and the leaves dwarfed and, frequently, mottled and necrotic. Severely affected shoots often die, though others appear to recover.

Field work on the effects of copper deficiency on wheat (p. 55 of the report) [ibid., xvii, p. 508; xviii, p. 546] showed that the increased yield resulting from copper applications was due to increase in the number of heads per plant and grains per head and to increase in the average weight of individual grains. Oats dressed with copper sulphate showed increase in the number of panicles per plant and grains per panicle, and excessive tillering was overcome. In both crops treatment with copper gave an increase in the percentage of head or panicle bearing tillers and in the grain/straw ratio.

In studies on the chemistry of plant viruses (pp. 58–60) the tobacco mosaic virus was found to behave like a typical colloidal solution of negatively charged protein particles. The higher the valency, the greater was the precipitating power of cations. The effect of anions on the precipitating power was so marked that they were readily placed in a series that agreed well in principle with the Hofmeister or lyotropic series for other colloids. The metallic ions of higher valency formed insoluble compounds with the virus, but the salts of monovalent cations almost always formed paracrystalline needle fibres, easily dispersed to submicroscopic dimensions by agitation or dilution.

The White Beauty tomato variety was found to have approximately the same degree of susceptibility to spotted wilt as Early Dwarf Red; White Stem Orinoco, Kelly, and Blue Pryor tobacco plants grown at the Waite Institute showed 80 to 100 per cent. natural infection by spotted wilt.

Littlejohn (L.). **Annual Report of the Botanist and Plant Pathologist for the year 1938.**—Reprinted from *Rep. Dir. Agric. Cyprus, 1938*, 4 pp., [1939].

This report [cf. *R.A.M.*, xviii, p. 90] contains the following items of interest, apart from those already noticed from other sources [cf. ibid., xvii, p. 787]. Potatoes were commonly attacked by *Macrophomina phaseoli* [ibid., xvii, p. 552], which caused much tuber rot in the field. In a further seed potato disinfection experiment carried out in co-operation with A. E. Muskett on the same lines as in 1937 disinfection with 0·5 per cent. aretan [ibid., xviii, p. 544] in Northern Ireland considerably reduced wastage by common and powdery scab (*Actinomyces scabies* and *Spongospora subterranea*, respectively), during transit. When the crop was lifted no powdery scab was found, the fungus, apparently, not being viable under the conditions prevailing in Cyprus. Taking the results as a whole, disinfection before or after transit reduced

the amount of common scab in the crop from over 20 per cent. to under 1, and increased the yield by 13 per cent., this increase apparently being due to the fact that more plants from the treated than the untreated seed reached maturity. Rotting in transit was inversely proportional to yield. Reduction in yield would, therefore, appear to have been due partly to rotting in the ground after planting, a process which disinfection partly prevents. The amount of scab in the crop again bore no relation to the amount of scab in the seed.

Orange mottle leaf [ibid., xviii, p. 91] was very common in some localities, particularly near Famagusta, little leaf [ibid., xvi, p. 94] and xyloporosis [ibid., xviii, p. 101] also being prevalent in some gardens. Oranges subjected to the following treatments: (1) wilted in a clean packing shed, (2) in a contaminated packing shed, (3), (4), and (5) dipped in 1, 0·5, or 0·25 per cent. shirlan, and (6) stem-end dipped in sulphur just before wrapping, were wrapped and boxed on 9th March at Famagusta and transported to Nicosia; when opened on 1st April they showed, respectively, 1·01, 17·28, 11·63, 11·09, 32·09, and 32·08 per cent. wastage [cause unspecified]. These results clearly show that fruit infection occurs chiefly in the packing shed; shirlan at the two higher concentrations appears to have given some control, the increased rotting in the other treatments probably resulting from the increased handling involved.

Rosellinia necatrix [ibid., xviii, p. 90] attacked seedling almonds and other fruit trees in a nursery, which was closed to prevent spread. The fungus was also found in several other localities on fruit trees, especially peach, apple, cherry, and almond.

Division of Plant Pathology.—*Rep. N.Y. St. agric. Exp. Sta., 1938–39*, pp. 23–28, 1939.

In this report [cf. *R.A.M.*, xviii, p. 236] on plant disease work in New York State in 1938–9 it is stated that wet wettable sulphurs (in paste form) were more effective against apple scab (*Venturia inaequalis*) than the same material used dry. Bordeaux mixture caused less injury when containing six times as much lime as copper sulphate than when it contained only twice as much. Bordeaux mixture 1½–9–100, or an insoluble copper with 2 lb. lime for each ¼ lb. actual copper with a residue builder, must be used in the first cover spray if oil sprays are to be used in later covers.

Abundant fruit and foliage infection was obtained with *Gymnosporangium* [*juniperi-*]*virginianae* [ibid., xix, p. 28] in five hours; foliage infection may occur within three hours of wetting after the sporidia are placed on the leaves. Infection may be obtained at 8° to 10° C., and the fruit is susceptible at any time after the fruit cluster has opened. Sporidia may remain viable on the foliage for about 24 hours. Lime-sulphur is effective eight hours after the sporidia are *in situ*, but after four hours wettable sulphurs cease to be toxic.

Against cherry leaf spot (*Coccomyces hiemalis*) [ibid., xviii, p. 785] wettable sulphurs with a residue builder were more effective than liquid lime-sulphur, while copper materials were much safer than these. Lime should be added to all insoluble coppers used against this fungus, in amounts equal to 1 lb. to each ¼ lb. metallic copper. Cupro-K is the

only copper material that can be used without lime in a non-residue programme, and even this material would probably cause yellowing. The addition of lime reduces control, and a residue builder should be added when possible. Cuprocide ($\frac{1}{4}$ to $\frac{1}{2}$ per 100) with a good spreader, such as igepon, is the only material that can be applied as a pre-harvest spray without residue.

Prompt application of wettable and liquid lime-sulphur prevents the development of gooseberry rust [*Puccinia pringsheimiana*: ibid., xvi, p. 476], liquid lime-sulphur apparently being preferable both against this disease and mildew (*Sphaerotheca mors-uvae*) [ibid., xv, p. 449]. Pre-blossom applications are the most important. One of the most effective ways of controlling the rust is to burn the sedge [*Carex*] leaves.

Under the conditions locally prevailing, dust or spray applications against hop downy mildew [*Pseudoperonospora humuli*: ibid., xviii, p. 236] can be delayed until a week before blossoming when the rainfall in June is much below average. Except in years when rainfall is abnormally heavy in spring, the critical period for control begins and terminates in July. Sprays containing lime reduce the average weight per cone by about 20 per cent. even when the final application is given before the cones develop. The spray recommended is Bordeaux mixture (4–2–100) plus $\frac{1}{4}$ per cent. cottonseed oil to reduce lime injury; even in gardens free from mildew this spray by reducing leaf-hopper infestation greatly increases yields.

Department of Botany.—*Rep. Pa agric. Exp. Sta., 1938–9* (*Bull.* 382), pp. 34–38, 1 fig., 1939.

In this report [cf. *R.A.M.*, xviii, p. 442] C. C. Wernham and H. B. Musser state that isolations from grasses on diseased patches of turf not amenable to mercury treatment on golf courses in Pennsylvania showed the presence of a foot rot organism (*Helminthosporium* sp.). Turf affected by snow mould [*Calonectria graminicola*: ibid., xviii, p. 298] showed a constant association between this disease and *Typhula itoana* [loc. cit.].

W. S. Beach states that when applied to tobacco trash used as a source of infection of wildfire [*Bacterium tabacum*: ibid., xviii, pp. 553, 784], Bordeaux mixture was more effective than other copper fungicides tested but did not prevent infection in seed-beds in which the plants had been atomized with a virulent culture of the organism. Intercropping tobacco with maize in alternate strips of four to six rows each reduced losses to 5 per cent., as against 30 per cent. in control rows of tobacco only. Shading and competition by the maize reduced the weight of the tobacco crop by about one-third. In plantings sown on different dates the amount of disease that developed appeared to depend on rainfall distribution. Soil in which affected tobacco leaves had decayed from autumn to spring failed to give rise to wildfire in the new crop. Two years' tests demonstrated that autumn sterilization of seed-beds is an important factor in control.

In work by J. W. Sinden on mushroom [*Psalliota* spp.]-growing piles of manure and synthetic compost were turned at intervals of 2, 4, 6, and 8 days for 24 to 32 days, and it was found that decomposition was most rapid and final loss of weight greatest when the piles were turned

every 6 days. Manure turned every other day lost dry weight slowly for 24 days, after which no further loss or heating occurred. Manure decomposed for 24 days and turned every other day produced the best crop of mushrooms, but when it was composted 8 days longer scarcely any mushrooms were produced. On the whole, both manure and synthetic compost gave the best yield in those piles which lost the least dry weight. Spore prints of valuable strains of mushrooms were kept viable for nine years. They were freed from contamination by keeping them long enough to allow the contaminants to die.

W. S. Beach found that species of *Trichoderma* caused much spotting, distortion, and splitting of mushroom stems and caps, some flushes being 10 per cent. affected. If the casing soil is dried out beforehand, it would appear to be safe to spray bearing beds with commercial formaldehyde at the rate of 1·5 to 2 lb. per 1,000 sq. ft. of bed surface, after diluting the spray material to 1 in 100. This treatment may cause 4 to 15 per cent. russeting, but the affected mushrooms remain suitable for canning.

Experiments by H. W. Thurston and H. N. Worthley showed that certain combinations of wettable sulphur with liquid lime-sulphur [against *Venturia inaequalis*] caused less injury to apples than lime-sulphur alone [ibid., xviii, p. 186], a combination of lime-sulphur 1 in 100 plus 4 lb. catalytic sulphur giving very promising results.

[Jensen (J. H.).] **Plant disease investigations.**—*Rep. P. R. agric. Exp. Sta., 1938*, pp. 121–129, 2 figs., 1939.

Further studies on bunchy top of papaw [*R.A.M.*, xviii, p. 375] showed that nymphs and adults of *Empoasca papayae* ultimately induced in healthy plants symptoms resembling those of the disease. Leafhoppers, probably of the same species, on papaw foliage were parasitized by *Entomophthora* [*Empusa*] *apiculata* [ibid., xix, p. 149].

Vanilla plantings on the Station grounds showed over 10 per cent. wilt or root rot, involving the destruction of the cortex and steles of the roots, in the parent bed and more than 33 per cent. in a recently replanted site where the crop had been abandoned some years ago on account of the disease. An inspection of twelve plantings covering over 100 acres showed that those six months old or less were free from attack, whereas all but three containing plants of one year old and upwards were infected; the incidence of the disease, which in the majority of cases was associated with a species of *Fusarium*, ranged from 1 to 90 per cent.

Stapp (C.) & Pfeil (E.). **Der Pflanzenkrebs und sein Erreger Pseudomonas tumefaciens. VIII. Mitteilung. Zur Biochemie des Krebsgewebes.** [Crown gall of plants and its agent *Pseudomonas tumefaciens*. Note VIII. On the biochemistry of the crown gall tissue.]—*Zbl. Bakt.*, Abt. 2, ci, 14–17, pp. 261–286, 1 fig., 1939.

In continuation of the studies of the first-named worker and collaborators on various aspects of crown gall of plants (*Pseudomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, xviii, p. 160], an investigation was made of the biochemical changes induced by the pathogen in the host tissues. The two strains used in the tests were Ra from dahlia and

IIb from *Chrys*[*anthemum*] *frut*[*escens*]. Most of the trials were carried out on sugar beets, supplemented in a few instances by Lucullus tomatoes, *Pelargonium*, and *Datura tatula*.

In the tumour tissues the hydrogen-ion concentration, the total sugar content, the fermentative capacity, and the calcium and magnesium contents were reduced in comparison with the sound material, whereas the glucose, nitrogen, phosphorus, and potash contents, and (in most cases) the dry substance were increased [ibid., xii, p. 148; xviii, p. 381]. Such deviations from the normal as were observed in the adjacent tissues were inconsiderable, the values of the latter approximating to those of healthy organs. There were no essential biochemical differences between infected plants receiving a combined mineral and organic or a pure mineral fertilizer. The galls induced by strain Ra were mostly smooth, while IIb tended to impart a rough, fissured context to the surface; moreover, the IIb tumours showed stronger catalase activity and slightly higher calcium values but a lower surface tension than those of Ra.

It is evident from these data that crown gall tumours differ very considerably in their biochemical constitution from other plant excrescences, such as potato wart tumours (*Synchytrium endobioticum*) [ibid., xvi, p. 120], the latter having a higher hydrogen-ion concentration and an increased calcium content but low ash, phosphorus, and potash contents in comparison with healthy plants. On the other hand, there are striking parallels between the galls of *Bact. tumefaciens* and malignant neoplasms in man and animals [ibid., xviii, p. 238], especially as regards the raised calcium and lowered magnesium contents, the decreased surface tension, and the reduced total sugar content.

LOCKE (S. B.), RIKER (A. J.), & DUGGAR (B. M.). **Production of growth substance on peptone broth by crown gall bacteria and related nongall forming organisms.**—*J. agric. Res.*, lix, 7, pp. 519–525, 1 graph, 1939.

In these further studies conducted by the authors [*R.A.M.*, xvii, p. 798] it was found that single-cell cultures of a virulent and an attenuated strain of the crown gall organism *Phytomonas* [*Bacterium*] *tumefaciens* and of the non-pathogenic *Bacillus radiobacter*, which differ widely in their pathogenicity, although similar in physiology, exhibited no significant differences in their ability to produce growth substance in peptone broth. The results are held to provide no support for the view that growth substances produced in such cultures have a direct major relation to the pathogenicity of crown gall bacteria [ibid., xvii, p. 448].

LOCKE (S. B.), RIKER (A. J.), & DUGGAR (B. M.). **The nature of growth substance originating in crown gall tissue.**—*J. agric. Res.*, lix, 7, pp. 535–539, 1939.

In this study growth substances obtained by ether extraction from tomato crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) [see preceding abstract] tissue, tomato foliage, and crown gall cultures on peptone broth proved to be much more stable in basic solutions than in acid ones. This indicates that beta-indole-acetic acid or some substance

similar to it in sensitivity to acid and alkali was present, while there was no evidence of the presence of auxin *a* or *b*, or of any other growth substance unrelated to beta-indole-acetic acid. The growth substance obtained from the foliage of normal plants was indistinguishable from that in the crown gall culture, so that it is not possible at the present to say whether the growth substance in crown gall tissue comes from the plant or the crown gall bacteria.

Bergey (D. H.), Breed (R. S.), Murray (E. G. D.), & Hitchens (A. P.). **Manual of determinative bacteriology.** Fifth Edn.—xi+1032 pp., London, Baillière, Tindall & Cox, 1939. 55*s*.

The present edition of the late Dr. Bergey's Manual contains descriptions of 1,335 species of bacteria, as compared with 832 in the first edition [*R.A.M.*, iii. p. 18]. [A detailed discussion of the basis of classification adopted in this edition is given by W. H. Burkholder in *Phytopathology*, xxix, 2, pp. 128–135, 1939.]

Waterhouse (W. L.). **Some aspects of plant pathology.**—*Rep. Aust. Ass. Adv. Sci.*, xxiv, pp. 234–259, 2 figs., 2 graphs, 1939.

In this presidential address to Section K of the Australian and New Zealand Association for the Advancement of Science the author, after referring to the financial losses caused by plant diseases, briefly summarizes the progress made in plant pathological work in New Zealand and Australia, and discusses various aspects of the problems connected with the cereal rusts (*Puccinia* spp.), with special reference to physiologic specialization.

Melchers (L. E.) & Johnston (C. O.). **The Wheat stem and leaf rust epidemics of 1938 in Kansas.** *-Plant Dis. Reptr, Suppl.* 116, pp. 51–68, 3 diags., 2 graphs, 1939. [Mimeographed.]

This is a tabulated survey of the meteorological conditions leading up to the stem and leaf rust [*Puccinia graminis* and *P. triticina*] epidemics in 1938 [*R.A.M.*, xviii, p. 663; xix, pp. 75, 139] in Kansas, where 1935 and 1937 were also years of severe stem rust outbreaks. Factors that generally limit infection, development, and spread of stem rust in Kansas are rainfall and recurrent dews. It does not usually spread in central or northern Kansas because of lack of rainfall in May or early June. Precipitation in 1938 was well distributed during these months. Minimum and maximum temperatures have been shown to be more important factors than mean temperatures, and until minimum temperatures become high enough for uredospore germination heavy stem rust inspections do not occur. Taking the minimum favourable temperature as 60° F. there were several infection periods in north-eastern and southern Kansas during 1938, and the minimum temperatures for May and June were the deciding factor in the epidemic in eastern, central, and western Kansas.

Meteorological conditions favouring stem rust also favoured leaf rust, but the latter is able to develop over a wider range of temperature than the former, especially at temperatures below 60°. Periods favourable for infection in May were not short as for stem rust but prolonged. The leaf rust epidemic was not only unusually heavy, causing a loss (conservatively estimated) of 12 per cent. for the State, but certain

varieties, such as Kawvale, which are ordinarily resistant in the field, were severely attacked. Physiologic race 9 [ibid., x, p. 363; xix, p. 10] was the most widespread, followed by 15 and 37.

Peturson (B.) & Newton (Margaret). **The effect of leaf rust on the yield and quality of Thatcher and Renown Wheat in 1938.**— *Canad. J. Res.*, Sect. C, xvii, 11, pp. 380–387, 1939.

In two experiments carried out at Winnipeg in 1938 to ascertain the effect of leaf rust (*Puccinia triticina*) on the yield and quality of wheat, Thatcher and Renown wheat were sown late in 1/400-acre plots, and Thatcher only was sown early in rod-row plots. Half the plots of each variety were given frequent applications of sulphur dust, and the remainder was left untreated. In the former test, infection reduced the yield of Thatcher and Renown by 51·17 and 29·61 per cent., respectively, while in the latter it reduced the yield on Thatcher by 37·02 per cent. Decreased yield was due mostly to reduced number of kernels per head. All the untreated plots ripened about three days before the dusted ones, and the grain from the former was one grade lower than that from the latter. Further, the grain from the dusted plots of both varieties was higher in protein and lower in carotene than that from the untreated plots.

Padwick (G. W.). **Note on the limitation of infection of Wheat by ascospores of Ophiobolus graminis Sacc. A possible explanation.**— *Ann. appl. Biol.*, xxvi, 4, pp. 823–825, 1939.

In experiments conducted in 1933 at the Imperial College of Science and Technology, London, single-spore cultures of *Ophiobolus graminis*, used to infest the soil in experimental pots, produced infection and ascospores on plants of Little Joss wheat, thus confirming the conclusion of Davis [*J. agric. Res.*, xxxi, 9, pp. 801–825, 1925] that the fungus is homothallic [*R.A.M.*, xix, p. 141]. It was observed that single spores removed from Petri dishes to tubes with fresh agar took several weeks to germinate, whereas those remaining in the dishes germinated within 24 hours. The explanation offered for this retardation of germination is that some chemical substance produced by the ascospores or the perithecia and necessary for the germination of the spores may become too dilute on their removal to fresh agar. It is suggested that this delay may prove fatal under non-sterile conditions where the spores have to compete for nutrients with other fungi, and may account for Garrett's failure to produce infection of wheat by ascospores in unsterilized soil [ibid., xviii, p. 386].

Winter (G.). **Der Einfluss der physikalischen Bodenstruktur auf den Infektionsverlauf bei der Ophiobolose des Weizens.** [The influence of the physical structure of the soil on the course of infection in Wheat ophiobolosis.]—*Z. PflKrankh.*, xlix, 10–11, pp. 513–559, 1 graph, 1939.

Garrett's method for the estimation of the extent of wheat infection by *Ophiobolus graminis* by the direct measurement of the runner hyphae of the fungus along the roots [*R.A.M.*, xiii, p. 433] was recently tested at the Bonn Phytopathological Institute and found to be superior to any of the others suggested for the purpose.

There is reason to believe that statements regarding an enhanced incidence of foot rot on the more compact types of soil are based either on the abundance of inoculum provided in such sites by susceptible grasses or else on the inadequate ploughing-under of the diseased stubble. In natural soil *O. graminis* is incapable of active saprophytic growth, and in its pseudosaprophytic phase the mycelium is subject to microbiological decomposition. The writer's inoculation experiments with monospore cultures maintained since 1936 on 2 per cent. malt agar at room temperature showed the fungus to be pathogenic to a number of grasses, including *Anthoxanthum odoratum*, *Agrostis spica-venti*, *Lolium temulentum*, *L. perenne*, *L. remotum*, *L. westerwoldicum*, *Dactylis glomerata*, *Bromus inermis* (very heavy infection, killing the plants shortly after emergence), *B. unioloides*, *B. mollis*, *B. hordeaceus*, *B. secalinus*, *B. patulus*, and *B. sterilis*, forming perithecia after five months on *A. spica-venti*, *Poa trivialis* (which in common with a number of other grass hosts harbouring abundant mycelium showed no external symptoms), the four *L.* spp., and the three last-named *B.* spp. The liability of these weeds to attack by *O. graminis* assumes considerable importance in the light of the rapid decline of soil inoculum in the absence of susceptible crops, and the inability of the fungus to spread through the soil except on its own hosts.

In pot experiments the compacting of loose soils led to a uniform reduction in the incidence of infection by the three physiologic races tested (S4, S23, and S28) [cf. ibid., xvi, p. 524], the decrease being generally most pronounced in moist substrata and associated with a deterioration in the aerating activity of the soil. In sterilized soils with a sufficient moisture content (50 per cent.) the adverse effect of compacting on the pathogen increased in proportion to the amount of clay or humus in the substratum, whereas in natural soils the position was reversed, probably through the operation of some modifying edaphic factor. In sterilized soils of low moisture content (20 per cent.) the compacting effect is strongest in sandy soils. In field experiments with summer and winter wheats, compacting of the seed-beds likewise caused a marked reduction of foot rot, e.g., from 223 to 52, 113 to 26, and 98 to 18 plants, in different plots. Generally speaking, the beneficial effects of soil-compacting are likely to be more noticeable in summer than in winter wheat; in any case little improvement can be expected in soils heavily infested by mycelium.

The growth of the inoculum of *O. graminis* in the soil appears to be accelerated by a loose soil structure, so that the control of foot rot through agricultural practices should fall under two heads; (*a*) the retardation of infection by compacting the soil during the growth of susceptible crops; and (*b*) the elimination of soil infestation by the provision of a loose texture during the cultivation of non-susceptible plants.

Schlichtling (Ilse). **Untersuchungen über die physiologische Spezialisierung des Weizenmehltaus, Erysiphe graminis tritici (DC.), in Deutschland. Vorläufige Mitteilung.** [Studies on the physiologic specialization of Wheat mildew, *Erysiphe graminis tritici* (DC.), in Germany. Preliminary note.]—*Kühn-Arch.*, xlviii, pp. 52–55, 1939.

A tabulated account is given of the writer's experiments at the Halle

Agricultural and Plant Breeding Institute on physiologic specialization in wheat mildew (*Erysiphe graminis tritici*) [*R.A.M.*, xviii, p. 385], some 50 German isolations of which, collected in 1936 and 1937 on Carsten V and Krafft's Dickkopf, were available in the conidial stage. The varieties inoculated by the fungus (in the form of aqueous suspensions applied to the leaves of ten-day-old seedlings at 15° to 22° C.) included the American selections of Dixon, Huron, and Illinois used by Mains in similar investigations [ibid., xii, p. 362], Red Fern, a strain of Black Persian, Vik's Norwegian Fram [ibid., xvii, p. 384], and forms of spelt, *Triticum durum*, *T. dicoccum*, *T. monococcum*, and *T. timopheevi*. Six physiologic races, all distinct from the two recognized by Mains, were differentiated on the basis of these tests, and it is considered probable that others also occur in Germany. For instance, the normally highly resistant Normandy variety was severely attacked in the field in the summer of 1938 by a strain which awaits analysis on the standard assortment.

Grace (N. H.). **Effects of plant and animal hormones on seeds damaged by formaldehyde.**—*Canad. J. Res.*, Sect. C, xvii, 12, pp. 445–451, 1939.

When Marquis wheat seed was immersed in solutions of formaldehyde or of formaldehyde containing either naphthylacetic acid or oestriol, an oestrogenic hormone, in concentrations of 0·1, 1, 5, and 10 p.p.m., and was germinated on blotting paper, both the oestriol and the naphthylacetic acid reduced formaldehyde injury equally [cf. *R.A.M.*, xvii, p. 802]. Growth of the treated seed in soil, however, showed no reduction in formaldehyde injury by either material. Germination counts after nine days on blotting paper indicated that though formaldehyde treatment did not reduce germination significantly, very significant effects were apparent in decreased length of stem and increased number of seminal roots per seedling. Formaldehyde injury was even more marked on plants grown in soil.

In another experiment, in which Marquis wheat seed was sprinkled with solutions of formaldehyde and indolylacetic acid and grown in soil, a treatment of 1 p.p.m. of indolylacetic acid reduced injury to a statistically significant extent, but 0·02 or 0·2 p.p.m. were insufficient.

Hayes (H. K.), Moore (M. B.), & Stakman (E. C.). **Studies of inheritance in crosses between Bond, Avena byzantina, and varieties of A. sativa.**—*Tech. Bull. Minn. agric. Exp. Sta.* 137, 38 pp., 6 figs., 1939.

In these investigations Bond oats were crossed with *Avena byzantina*, and several varieties of *A. sativa*, including Anthony, Iogold, Rainbow, and two selections called Double Cross A and Double Cross B derived from previous crosses of (Minota × White Russian) × Black Mesdag oats and the results studied with reference to the manner of inheritance of characters differentiating varieties of *A. byzantina* and *A. sativa*, and the reaction of these varieties to stem rust (*Puccinia graminis avenae*), crown rust (*P. coronata*), and smuts (*Ustilago avenae* and *U. levis*). It was found that stem rust was dominant to susceptibility, segregation in the F_2 and F_3 being explained on the basis of a single-factor difference. The physiologic races of stem rust used were

those to which White Russian was resistant. Bond was resistant to all the physiologic races of crown rust used, though in two seasons a race of crown rust appeared to which Bond was susceptible [*R.A.M.*, xviii, p. 794]. The F_1 generation of all crosses was resistant, though less so than Bond. The F_2 generation of the cross between Bond and Rainbow approached a ratio of 3 resistant to 1 susceptible, indicating only a single-factor difference; the other crosses gave a segregation of resistant to susceptible in a 9 : 7 ratio, indicating two major factors for differentiating resistance and susceptibility. For both rusts agreement was good between seedling reaction in the greenhouse to a single race and field reaction to the collection of races used.

Bond and Double Crosses A and B were resistant to the smuts under field conditions. In the cross between Bond and Double Cross A some susceptible lines occurred in the F_3 generation, showing that the factor or factors responsible for resistance were unlike in the Bond and Double Cross A parents. In the crosses of Bond with Iogold and Anthony there were indications of a single major-factor difference, with some evidence of minor modifying factors.

It is concluded that it should not be difficult to combine resistance to these diseases with the characters of cultivated varieties of *A. sativa* and plumpness of grain.

Campi (Maria D.). **'Helminthosporium turcicum' Pass. en la Republica Argentina.** [*Helminthosporium turcicum* Pass. in the Argentine Republic.]—*Lilloa Rev. Bot. Tucumán*, iv, 1, pp. 5–32, 6 pl., 8 figs., 3 graphs, 1939. [English summary.]

This is a comprehensive study on maize blight (*Helminthosporium turcicum*) [*R.A.M.*, xviii, p. 517], which is stated to be very prevalent in the Argentine, where it is here recorded for the first time on Sudan grass and Kaffir sorghum.

Inoculation experiments on maize plants in a saturated atmosphere with conidial suspensions of the fungus from 1 per cent. potato glucose agar cultures resulted in 81 per cent. infection, the punctiform, chestnut, reddish, or straw-coloured necrotic lesions with pale margins developing on the leaves in 24 to 48 hours. Infection may take place through the stomata or directly by penetration of the cuticle. *H. turcicum* grows well on various standard media at 20° to 30° C., conidial production being most profuse at the lower limit. The dimensions of the conidia formed in culture are generally smaller than those of the same organs in their natural habitat; for instance, on potato glucose agar the mean measurements of three collections were 89·4 by 19·0, 86·9 by 17·3, and 92·2 by 17·9μ, respectively, the average number of septa ranging from 5·0 to 5·8, compared with means of 103·9 by 22·5 and 99·1 by 22μ, respectively, with 5·1 to 5·4 septa, for conidia taken directly from the host tissues. The optimum hydrogen-ion concentration for *H. turcicum* was found to be P_H 5·7.

Storey (H. H.). **Investigations of the mechanism of the transmission of plant viruses by insect vectors. III. The insect's saliva.**—*Proc. roy. Soc.*, Ser. B, cxxvii, 849, pp. 526–543, 1 pl., 2 figs., 1939.

In further studies on the transmission of streak disease of maize by

Cicadulina mbila [*R.A.M.*, xviii, p. 727], observations were made on the insect penetrating a wax membrane and feeding on sugar solution. The maxillary stylets pierced the membrane in a series of jerky, advancing and retiring movements, and during withdrawal only a colourless saliva, which immediately set to a gel, was ejected, and moulded by the continued movements of the stylets into a sheath. Although evidence seems to point to the jelling saliva as the vehicle of virus inoculation, in previous experiments [ibid., xvii, p. 387] no infection was obtained with a feeding time of less than 5 minutes. The present work has shown the maximum excretion of saliva to take place in the shorter time between penetration and the beginning of feeding, and no other material of insect origin was observed to flow from the stylets so that the manner in which *C. mbila* introduces the virus still remains obscure.

When the salivary glands of infective *C. mbila*, washed in sterile saline to remove possible surface contamination from the blood stream, were inoculated into the abdomens of non-infective ones, a few of the latter became infective. Positive results were also obtained with mid-intestines of insects fed on diseased plants, while other organs, which were as likely to carry a surface contamination from blood as the salivary glands, gave negative results, thus supporting the conclusion that the salivary glands may contain virus, either occasionally or in very small quantities.

Inoculation or feeding of non-infective *C. mbila* with fluids upon which the infective ones had fed failed to render the former infective; simultaneous feeding of both infective and non-infective insects on a film of fluid held between two membranes gave positive results in one out of 16 sets of experiments, but these newly infective insects never caused infection in more than one test. Similarly, inoculation of non-infective insects with juice from crushed maize leaves upon which infective ones had fed gave negative results, and only simultaneous feeding on a small area of a leaf caused a few non-infective insects to become infective, although again these were of low infective ability. It is suggested, on the basis of these results, that infective *C. mbila* eject virus in such small quantities that rarely enough reaches a non-infective insect to make it infective, and then only weakly so.

KARLING (J. S.). **A new fungus with anteriorly uniciliate zoospores: Hyphochytrium catenoides.**—*Amer. J. Bot.*, xxvi, 7, pp. 512–519, 18 figs., 1939.

A description [with Latin diagnosis] is given of a new fungus, *Hyphochytrium catenoides*, found to occur as a saprophyte or weak parasite in the trichomes and parenchyma cells of portions of maize leaves used in inoculation experiments with *Physoderma zeae-maydis* [*P. maydis*: see Mundkur 'Fungi of India, Supplement I', p. 7, 1938]. The species is characterized primarily by anteriorly uniciliate zoospores. So far no sexual organs or resting spores have been found.

MCNEW (G. L.) & SPENCER (E. L.). **Effect of nitrogen supply of Sweet Corn on the wilt bacterium.**—*Phytopathology*, xxix, 12, pp. 1051–1067, 2 figs., 2 graphs, 1939.

In further studies on the influence of nitrogen on the reaction of Golden

Bantam maize seedlings to wilt (*Phytomonas* [*Aplanobacter*] *stewarti*) infection [*R.A.M.*, xvii, p. 518; xviii, p. 173], the addition of this element to the nutrient solution increased the concentration of nitrogen in the tracheal sap, and when this amounted to 20 to 40 p.p.m. the bacteria invaded the seedlings; when larger quantities were supplied (to induce a nitrogen concentration in the sap of 270 p.p.m.) the rapid assimilation of the nutrient by the plants quickly led to its exhaustion, so that soon after feeding there was an insufficient amount to promote good bacterial growth. Virulent strains of the organism tended to develop more profusely in plants given nitrogen than in those from which this element was withheld, though in some of the tests virulent strains persisted for lengthy periods in nitrogen-deficient seedlings. It was experimentally shown that feebly and strongly virulent strains were about equally aggressive in seedlings deprived of nitrogen, whereas highly pathogenic forms were stimulated to more intensive activity by heavy additions of the nutrient.

A motile contaminant, isolated from nitrogen-deficient seedlings and secreting a brown pigment on agar slants after two to three weeks, proved equally virulent with *A. stewarti* in plants without nitrogen but much less so in those supplied with the element.

Vladimirsky (S. V.). Географическое распространение и зоны вредоносного значения спорыньи на Ржи в СССР. [Geographical distribution and zones of injurious influence of ergot on Rye in the U.S.S.R.]—*Sovetsk. Bot.*, *1939*, 5, pp. 77–87, 13 graphs, 1 map, 1939.

Observations on the development of ergot (*Claviceps purpurea*) [*R.A.M.*, xix, p. 95] on rye in various parts of the U.S.S.R. [ibid., xvi, p. 31] made during 1934–5 showed that the period of rest required by the organism prior to the germination of sclerotia lasts under natural conditions for about eight to nine months. The sclerotia germinate in the spring at a temperature of about 11° C. and the process is greatly favoured by moist soil conditions in the previous autumn. Sclerotia which fail to germinate in the spring usually lose their viability before the autumn of the same year. The stromata develop within ten days at optimal meteorological conditions (temperatures above 12·2° and high humidity), but take about a month or more when temperatures are low or variable and there is a lack of moisture. The perithecia take five to seven days from the appearance of the stroma to mature (i.e., to eject ascospores) under conditions of high humidity (76 to 78 per cent. saturation) and precipitations of not less than 21 mm., but the period is prolonged to between 15 and 30 days at lower humidity. The greatest development of ergot infection (over 10 per cent.) was observed in regions where the following conditions obtained: (1) a relative humidity during flowering (most usually the third ten days of June) of 74 per cent. or above (or not less than 70 per cent. during the time of flowering and the previous two ten-day periods); (2) a temperature at the beginning of flowering not above 13° to 15°; and (3) a flowering period of 14 days. Medium development of ergot infection (1·4 to 2·8 per cent.) occurred when the relative humidity during the time of flowering and the previous two ten-day periods was about 60 per cent., whereas one of 55 to 58 per cent. during the same period strikingly reduced

development. The regions with optimal, intermediate, and adverse meteorological conditions for the development of ergot are separated into three groups, which roughly coincide with the regions of maximum, medium, and minimum economic importance of the disease. Data are given on the geographical distribution of ergot on the territory of the Union during the periods 1834 to 1930 and 1932 to 1936. It appears that serious epidemics occur most often in the northern and north-eastern districts, and less frequently in the central belt, while in southern and south-eastern districts only isolated infected plants have been observed.

TYLER (L. J.). **Variation in Sphacelotheca sorghi (Link) Clinton.**—*Tech. Bull. Minn. agric. Exp. Sta.* 133, 48 pp., 8 figs., 2 graphs, 1938. [Received January, 1940.]

The cytological phenomena associated with chlamydospore germination in potato dextrose agar cultures of *Sphacelotheca sorghi*, the causal organism of covered kernel smut of sorghum [*R.A.M.*, xviii, p. 18], revealed much greater variability and more extensive deviation from the normal type than hitherto accepted. Essentially the life-cycle of *S. sorghi* resembles that of several species of *Ustilago*.

Sex in *S. sorghi* may be conveniently and reliably determined by sporidial fusions and the Bauch test [ibid., vi, p. 744]. Evidence was obtained in confirmation of Rodenhiser's observation that the sexual compatibility of paired lines may be ascertained soon after sorghum plants have been inoculated. Segregation of sex factors was apparently complete in the first or second nuclear division of the germinating spore. Two sex groups were distinguished, with factors for sex segregating in the ratios of 2 : 2 and 1 : 3. The existence of more than two (probably three) sexual compatibility groups was demonstrated. The segregation of factors for cultural characters in four ratios of 2 : 2, 4 : 0, 3 : 1, and 2 : 1 : 1 was shown to take place independently of those governing sex.

In artificial culture *S. sorghi* falls into an indefinite number of types differing in one or more of the following characters: size, colour, growth habit and direction, consistency of colonies, topography, and type of margin. Further studies are necessary to establish the pathogenicity and consequent importance of paired compatible lines arising as sectors through mutation. Sectoring was stimulated by certain nutrients, e.g., malt agar and plain sugar media plus nitrogenous salts, and was largely confined to certain lines. Fourteen lines remained culturally constant for over a year on potato dextrose agar, but eight of them produced one or more sectors of new cultural type on transference to malt agar. Lines of *S. sorghi* derived from intraspecific hybridization between monosporidial lines from different chlamydospores varied in pathogenicity, as indicated by stunting of the infected plants, colour of the peridia, size and hardness of smut balls, chlamydospore dimensions, and period required for chlamydospore germination.

BATES (G. R.). **Recent developments in the processing of Rhodesian Oranges.**—*Proc. Rhod. sci. Ass.*, xxxvii, pp. 29–35, 1939.

About 90 per cent. of the decay in Rhodesian oranges exported to England is due to *Penicillium digitatum* [*R.A.M.*, xvii, p. 310], though *P. italicum* [ibid., xix, p. 88] also causes appreciable loss. Rot due to

Diplodia natalensis [loc. cit.] is most commonly found in the earliest varieties, infection in nature generally arising from the button tissues. Infection by *Alternaria citri* [ibid., xvii, p. 310] occurs in a similar way, and may cause a stem-end, blossom-end, lateral, or black centre rot, of which the last is commercially the most serious. Anthracnose (*Colletotrichum gloeosporioides*) [ibid., xvii, p. 311; xix, p. 87] may develop as a lateral rot or a semi-pliable stem-end rot, frequently in association with *A. citri*; it chiefly attacks late shipments of mature oranges. Both fungi are regularly and extensively present as latent infections in the rind of small, immature oranges, and are completely resistant to ordinary fungicidal treatment. Mature oranges with poor storage and carrying qualities are very susceptible to latent infections.

The development of mould decay, particularly *P. digitatum*, during wilting is accompanied by a marked increase in atmospheric spore content and spore load on the fruit. Shortening wilting to a period of 24 to 48 hours reduced transit decay without causing excessive shrinkage or loss of weight, and also minimized 'ageing'. Wilting for one or two days is regarded as sufficient in Rhodesia, unless the fruit has been rendered turgid by rain or irrigation, in which case it is submitted to preliminary wilting for 24 hours or more in the grove before dispatch to the packing-house.

P. digitatum was controlled by using wrappers impregnated with orthophenylphenol [ibid., xviii, p. 805], but unless used at very low concentrations this chemical causes rind injury, largely preventable, however, by incorporating a glyceride oil such as olive or groundnut oil into the wrappers.

Sooty blotch and fly speck [the fungi involved have not yet been ascertained definitely in Rhodesia] have become increasingly prevalent on oranges from the Mazoe valley. The former can be removed in 30 to 45 seconds, and the latter in about twice this time, by dipping in a solution containing 4 oz. bleaching powder [chloride of lime] and 3 oz. sodium bicarbonate per gal. water. If fungal decay is troublesome, a modified solution containing chloride of lime and boric acid may be substituted.

During rail transport oranges, until they attain about 40° F., continue active transpiration, the process sometimes being accompanied by physiological rind injury due to excessive desiccation of the cell tissues. Wrappers, if too retentive of moisture, may induce mould decay; if, however, waxed paper box-liners could be used in conjunction with orthophenylphenol wrappers, the combination might have far-reaching results. Local experiments indicate that type of fertilizer and cultural methods may influence low temperature injury in oranges.

Miller (E. V.) & Schomer (H. A.). **Physiological studies of Lemons in storage.**—*J. agric. Res.*, lix, 8, pp. 601–607, 1939.

An account of this work has already been noticed from another source [*R.A.M.*, xviii, p. 673].

Dastur (J. F.). **Stem breaking of Cotton.**—*Agric. Live-Stk India*, ix, 6, pp. 685–687, 2 pl., 1939.

A stem-breaking disease of cotton occurring in epidemic form in the

Nimar district, Central Provinces, in 1938 is described. Its most conspicuous feature is the bending over of the plants about ½ to 2 in. from above the collar or soil-level. The varieties affected included Verum 434, Verum 262, and deshi, the first-named raised from delinted seed. The fungi isolated from the broken parts of the stem, *Fusarium* spp., *Rhizoctonia bataticola* [*Macrophomina phaseoli*: *R.A.M.*, xviii, p. 674], and *Colletotrichum* sp., were confined to the dead tissues, and the trouble is tentatively ascribed to the effect of persistent wind of abnormally high velocity on plants of unduly luxuriant growth.

Miller (P. R.) & Weindling (R.) **A survey of Cotton boll rot diseases in 1939 and the microorganisms associated with them.**—*Plant Dis. Reptr*, xxiii, 20, pp. 329–334, 2 maps, 1939. [Mimeographed.]

The results [which are tabulated and briefly discussed] of a survey carried out during 1939 in the cotton-growing regions of the United States to ascertain the prevalence and relative distribution of the fungi associated with boll rot [*R.A.M.*, xviii, pp. 519, 787] confirmed the previous evidence of the prevalence of *Glomerella gossypii*. This species was present in 82·3 per cent. of the fields examined, or in 90·1 per cent. if Texas and Oklahoma are omitted. It was obtained in culture from 29·9 per cent. of 2,959 bolls, but was found in fewer from Louisiana and Arkansas than from more easterly States (3·8 and 5·1 per cent., respectively, as against 33·2 per cent. in Mississippi and 34·7 per cent. in Alabama).

An interesting result of the survey was the evidence of the prevalence and frequency of *G. gossypii* in the eleven cotton States east of Texas and Oklahoma and its apparent absence to the west of this region; it may be significant to note the apparent correlation of the general extent of the disease with high humidity.

The other boll rot organisms most frequently found were again *Alternaria* spp., *Fusarium moniliforme* [*Gibberella fujikuroi*: ibid., xix, p. 89], and *F.* spp.

Barducci (T. B.). **Departamento de Genética Vegetal. Memoria de la Sección Genética de Algodon (Valle de Lima).** [Department of Plant Genetics. Memorandum of the Section of Cotton Genetics (Lima Valley).]—*Mem. Estac. exp. agric. Soc. nac. Agr., Lima*, 11a, pp. 285–321, 5 col. pl., 28 figs., 16 graphs, 1939. [Received February, 1940.]

One of the chief problems engaging the attention of cotton geneticists in Peru is the development of selections of the Tangüs variety combining resistance to wilt (*Verticillium* sp.) [*R.A.M.*, xviii, p. 25] with desirable commercial characters; outstanding from this point of view is the line Cñ–LM7–35. Some degree of tolerance has also been shown by Giza 7, introduced from Egypt in 1935, and to a lesser extent by Sakellaridis, Pima, S×P (1938–9), Sea Island, Semiáspero, and Riñón, in contrast to the susceptible representatives of the Upland group cultivated locally, viz., Mars Rose, Coker-Wilds, Miller, Dixie 14–5, Dixie Triumph, Delfos, and Acala.

Under local conditions in the Lima Valley the incidence of infection in stands from September-sown seed was shown by counts at 30-day

intervals during the growing seasons from 1935 to 1938 to increase most rapidly during January (from 30 to 80 per cent.), slower rises taking place in February and March (up to 90 or 95 per cent.), while the total in May reached 98 per cent. Data are adduced pointing to the inadvisability of unduly early sowing, e.g., in July, when the low soil temperature (mean of 17·5° C.) checks the normal growth of the seedlings and exposes them to ready infection by *V.* sp., favourable conditions for the development of which develop from August onwards. Other preventive measures should include judicious crop rotation; delayed irrigation to secure vigorous root development; dense stands to maintain regular and uniform soil humidity; use of superior, first-year seed; and thorough tillage of the soil, with strict attention to all practices tending to promote a strong root system, the avoidance of any injury to which is likewise of the first importance.

Francke-Grosmann (Helene). **Über das Zusammenleben von Holzwespen (Siricinae) mit Pilzen.** [On the symbiosis of wood wasps (Siricinae) with fungi.]—*Z. angew. Ent.*, xxv, 4, pp. 647–680, 17 figs., 1 diag., 1939.

A comprehensive account is given of the writer's studies at the Tharandt (Saxony) School of Forestry on the symbiotic relationships between wood wasps of the genera *Xeris*, *Paururus* [*Sirex*], *Sirex*, and *Tremex*, and wood-destroying fungi, of which those associated with *S. gigas* [*R.A.M.*, xiii, p. 440] on fir and *T. fuscicornis* on walnut were identified as *Trametes odorata* and *Polyporus imberbis*, respectively, both characterized by a strong aroma (reminiscent of vanilla in the latter) [ibid., xix, p. 54]. The loss of weight in poplar blocks inoculated with *P. imberbis* from *Tremex fuscicornis* amounted to 19·7 per cent. of the total in three months, the corresponding figures for unidentified fungi from *Paururus* [*S.*] *noctilio* [cf. ibid., xiii, p. 341] and *P.* [*S.*] *juvencus*, *S. augur*, and *S. gigas* ranging from 3·2 to 13·5 and 1·8 to 4·2 per cent., on fir and pine blocks, respectively. The lignin and cellulose contents of the poplar blocks were reduced by 51·1 and 52·2 per cent. by *Polyporus imberbis* from *T. fuscicornis* during a period of five months, while the *Sirex* fungi caused losses of 1·9 to 22·8 per cent. cellulose and 12·8 to 16·3 per cent. lignin in fir blocks.

Generally speaking, the wood-destroying fungi from wasps form no fruit bodies in pure culture (on clarified malt gelatine), *P. imberbis* being the sole exception in these experiments. They occur in the insects in specific intersegmental organs. The wasps are thus of silvicultural importance, not only on account of the depredations made by their larvae, but also as vectors of wood-destroying fungi.

Charles (Vera K.). **Notes on entomogenous fungi.**—*Plant Dis. Reptr*, xxiii, 21, p. 340, 1939. [Mimeographed.]

Specimens of *Anopheles quadrimaculatus* from Florida were found to be parasitized by *Beauveria bassiana* [*R.A.M.*, xix, p. 72] and a species of *Spicaria*, both apparently new records for mosquitoes; the sweet potato weevil (*Cylas formicarius*) from Georgia by a species of *Fusarium* (and in a previous collection of 1935 from Mississippi by *B. globulifera*); and the Norway maple aphid *Periphyllus lyropictus* (a severe pest of

Hydrangea arborescens in New Hampshire) by *Empusa fresenii* [ibid., xviii, p. 157] in the conidial and resting spore stages, believed to be reported for the first time on this host.

MANN (H.). **Die Brandfleckenkrankheit beim Sumpfkrebs (Potamobius leptodactylus Eschh.).** [The scorch spot disease of the Marsh Crayfish (*Potamobius leptodactylus* Eschh.).]—*Z. Parasitenk.*, xi, 2–3, pp. 431–432, 1939.

Cephalosporium leptodactyli n. sp. [without a Latin diagnosis] was isolated on dextrose agar from marsh crayfish (*Potamobius leptodactylus*) in the vicinity of the Plattensee, Tihany, Hungary. The fungus, which is characterized by hyaline, septate hyphae, 3 to 4 μ in diameter, and concatenate, hyaline conidia, 9 to 13 by 3 to 5 μ, produces brownish-red to black spots of varying size on the shells.

CASTELLANI (A.). **Brief notes on three new species of Trichophyton (T. batonrougei, T. guzzonii, T. tenuishypha) and a little known species (T. louisianicum).**—*J. trop. Med.* (*Hyg.*), xlii, 24, pp. 373–378, 1 col. pl., 13 figs., 1939.

Full descriptions [without Latin diagnoses] are given of *Trichophyton batonrougei* n. sp., isolated from four cases of tinea capitis in negro children at New Orleans, *T. guzzonii* n. sp. from a case of ringworm of the dorsum of the foot in a negro boy, also at New Orleans, and *T. tenuishypha* n. sp. from a case of generalized pruritus in a European woman in London, formerly resident in the West Indies.

On 2 to 4 per cent. glucose agar and on milk agar *T. batonrougei* forms chestnut-coloured colonies and produces an abundant mycelium, of various types, occasionally including the racquet, the hyphae ranging from 2 to 4 μ in width (average 2·8 μ). Conidia and aleuriospores are extremely scanty. In hanging-drop peptone water cultures at 30° C. fusiform or lemon-shaped, rarely almost triangular, terminal and intercalary structures, presumably chlamydospores, have been observed, measuring 24 to 36 by 16 to 28 μ, containing (in the case of two strains of the fungus) peculiar sporiform bodies, 2 to 4 μ in diameter. *T. batonrougei* slowly liquefies gelatine but not coagulated serum, and does not clot litmus milk or produce gas from any of the sugars or other carbon compounds tested.

T. guzzonii is characterized on glucose agar by particoloured colonies, viz., orange, reddish or rust-coloured, and whitish, the surface of fully grown cultures after removal of the 'duvet' being brownish-black and often mammelonated, somewhat resembling those of *T. dankaliense* [*R.A.M.*, xvii, p. 319]. The hyphae of the luxuriant mycelium range from 1 to 2 to 6 to 12 μ in diameter. Neither aleuriospores, chlamydospores, nor closterospores have been detected. The biochemical characters of the fungus are similar to those of *T. batonrougei*.

The colonies of *T. tenuishypha* on glucose agar are fluffy, white at first, later turning black. The hyphae range from 1 to 3 μ in diameter, mostly 1·2 to 2·5 μ, and in the centre of the cultures may amalgamate into a sort of prosenchyma. Neither closterospores nor aleuriospores have so far developed. The biochemical characters of the fungus resemble those of the two foregoing.

T. louisianicum [ibid., vii, p. 169], isolated from tinea capitis in negro children at New Orleans, forms on glucose agar canary-coloured colonies, sometimes with reddish spots or a reddish to brownish margin at maturity. Hyphae are abundant and closterospores have also been observed, but no true aleuriospores. Milk agar is the most suitable medium for growth. Like the other fungi herein reported, *T. louisianicum* produces no gas from any sugar.

Inoculation experiments with these four species gave negative results.

Emmons (C. W.) & Hollaender (A.). **The action of ultraviolet radiation on dermatophytes. II. Mutations induced in cultures of dermatophytes by exposure of spores to monochromatic ultraviolet radiation.**—*Amer. J. Bot.*, xxvi, 7, pp. 467–475, 14 figs., 2 graphs, 1939.

In further studies on the effect of ultra-violet radiation on *Trichophyton mentagrophytes* [*R.A.M.*, xviii, p. 737], spores of a strain of this fungus isolated from a case of ringworm of the arm were exposed to ultra-violet light in the region of wave lengths of 2,280 to 2,950 Å. The treatment induced a temporary retardation of germination, which disappeared on subculturing, and the production of comparatively stable mutants. The latter differed from the parent strain and usually from each other in the degree or type of pigmentation, the rate of growth, or in the amount and type of aerial hyphae produced, and are accordingly placed in six arbitrarily delimited groups. Some of the mutants closely resembled other varieties of the fungus, indicating that the species is highly mutable. The mutant production showed a definite maximum at 2,537 to 2,650 Å. No mutants appeared in over 2,000 control colonies grown from non-irradiated spores, but as some mutants of this general type can be isolated from old non-irradiated cultures, it is believed that the exposure to ultra-violet radiation merely accelerates the normal process of mutation in this and other species of the dermatophytes.

Danbolt (N.) & Mossige (K.). **Sølvrev som smittekilde for trichophyti hos mennesker.** [The Silver Fox as a source of trichophytosis infection in Man.]—*Norsk VetTidsskr.*, li, 3, pp. 85–92, 6 figs., 1939. [English summary.]

At the Dermatological Clinic of Oslo University a number of persons engaged in raising silver foxes (a very important industry in Norway) were found to be suffering from trichophytosis due to *Trichophyton gypseum asteroides* [*T. mentagrophytes*: *R.A.M.*, xix, p. 92 and preceding abstract], which was isolated both from the patients and from the similarly affected animals and grown in pure culture on maltose, glucose, and peptone agar.

Perpignano (G.). **Le tigne della Provincia di Cagliari (ricerche cliniche batteriologiche e sperimentali).** [Ringworms of the Province of Cagliari (clinical, bacteriological, and experimental researches).] *G. ital. Derm. Sif.*, lxxx, 3, pp. 489–534, 2 pl., 1939.

This is a comprehensive survey of the author's studies on the 2,107 cases of ringworm [*R.A.M.*, xviii, pp. 177, 522, 523] treated under his

direction at the Cagliari (Sardinia) University from 1933 to 1938, inclusive. Of the total number examined, 63·15 per cent. were due to *Trichophyton violaceum*, 15·3 to *T. plicatile*, 7·61 to *T. crateriforme*, 4·1 to *T. rosaceum*, 4 to *T. glabrum*, 3 to *T. acuminatum*, and 1 to *T. cerebriforme* [ibid., xix, p. 17], the incidence of the other six *T.* spp. being under 1 per cent.; favus (*Achorion*) was present to the extent of 8·3 per cent. *T. album* [ibid., xviii, p. 456], *T. niveum radians*, and *T. granulosum* [*T. mentagrophytes*] are here recorded for the first time for Sardinia.

Grigoraki (L.) & David (R.). **Caractères bio-chimiques de Trichophyton granulosum (Pégus, 1909).** [Biochemical characters of *Trichophyton granulosum* (Pégus, 1909).]—*C.R. Soc. Biol., Paris*, cxxxii, 25, pp. 392–394, 1939.

The systematic position of *Trichophyton granulosum* being very ambiguous, a biochemical study [cf. *R.A.M.*, xviii, p. 678] of the fungus was made with a view to elucidating the situation. Casease was found to be very active in this species, the dissolution of casein beginning on the first day of culture in Sabouraud's medium and being completed at the end of a month. Trypsin was moderately active, but only started to liquefy gelatine when cultures containing 18 per cent. of this substance reached the age of about a month, the process then being accomplished in another 25 days or so. During a period of 30 days the colour of glucose, mannose, and galactose solutions ranged through orange 116 to yellow-green 256, purple-red 591 to yellow-green 253D, and purple-red 591 to red-orange 66 (Klincksieck & Valette), respectively. The development of indol was negligible. These characters differ entirely from those of *T. asteroides* [*T. mentagrophytes*] and other species of the microid group associated with deep-seated folliculitis.

Scarpa (A.). **Favo e favide della cute glabra.** [Favus and favids of the glabrous skin.]—*G. ital. Derm. Sif.*, lxxx, 6, pp. 1103–1117, 1 pl., 1939.

This is a general survey of contemporary studies on the theoretical and practical aspects of favus of the glabrous skin, illustrated by the clinical history of a case of the disorder in a 30-year old woman treated at the Rome University Skin Hospital. The causal organism (*Achorion schoenleini*), originating in the scalp, induced secondary cutaneous reactions in other parts of the body.

Schattenberg (H. J.) & Flinn (M.). **Experimental studies on bronchomoniliasis.**—*Proc. Soc. exp. Biol., N.Y.*, xli, 2, pp. 557–558, 1939.

At the Tulane University School of Medicine, New Orleans, Louisiana, rabbits injected intravenously with cultures of *Monilia* [*Candida*] *albicans* from a case of bronchomycosis [*R.A.M.*, xix, pp. 17, 18] readily developed the pathological symptoms characteristic of the disease in man. Moreover, the histopathological changes in the animals varied according to the period of survival as controlled by the dosage employed and presented far-reaching analogies with the acute and chronic types of the malady as observed in human beings

Carol (W. L. L.). **Mycosis profunda s. generalisata, veroorzaakt door Candida albicans.** [Deep-seated, generalized mycosis caused by *Candida albicans*.]—*Ned. Tijdschr. Geneesk.*, lxxxiii (ii), 21, pp. 2423–2429, 3 pl. (1 col.), 1939.

Candida albicans, identified by Dr. Diddens, was isolated in Amsterdam from the diseased tissues in a 61-year-old male patient suffering from deep-seated, generalized mycosis [see preceding and next abstracts].

Beatty (O. A.). **Chronic pulmonary moniliasis.**—*Kentucky med. J.*, xxxvii, 7, pp. 269–271, 1939.

A report is given of a case of chronic pulmonary infection due to *Monilia* [*Candida*] *albicans* [see preceding abstracts] in a 44-year-old man at Glasgow, Kentucky, the fungus having repeatedly been cultured from the sputum and the tuberculin test giving negative results.

De Almeida (E.) & Lacaz (C. Da S.). **Frequencia das micoses pulmonares en São Paulo.** [The incidence of pulmonary mycoses in São Paulo.]—*Ann. paulist. Med. Cirurg.*, xxxviii, 1, pp. 4–14, 1939. [English summary.]

Of 422 samples of sputum from cases of pulmonary disease examined by the authors from 1935 to 1938, inclusive, 140 (31·1 per cent.) were positive for fungi, including 14 of *Aspergillus*, 12 of *Penicillium*, 2 of *Rhizopus*, and 1 of *Mucor* [cf. *R.A.M.*, xvii, p. 529]. A species of *Penicillium*, probably *P. crustaceum*, was isolated from the bronchial secretions of a female asthmatic patient who was successfully treated by iodide therapy.

Stolow (A. J.). **Primary broncho-pulmonary aspergillosis.**—*J. med. Soc. N.J.*, xxxvi, 8, pp. 484–485, 1939.

A species of *Aspergillus* [see preceding and next abstracts] was isolated in pure culture from the bronchial secretions of a 27-year-old farmer suffering from a pulmonary disorder incorrectly diagnosed as tuberculosis at the State Sanatorium for Tuberculous Diseases, Glen Gardner, New Jersey. The fungus is believed to have been primarily responsible for the trouble and would probably be detected in numerous other cases of doubtful origin by careful bronchoscopic and sputum examination.

Bassi (A.). **Due casi di aspergillosi polmonare ed alcune considerazioni sociali sulle micosi.** [Two cases of pulmonary aspergillosis and some social aspects of mycoses.]—*Settim. med.*, N.S., xxvii, 13, pp. 381–384, 387–390, 393, 5 figs., 1939.

Clinical histories are given of two cases of pseudotubercular disturbance at Piacenza, Italy, one in a 38-year-old farmer and the other in a 32-year-old miller. A species of *Aspergillus* [see preceding abstracts] was isolated in both instances from the sputum and inoculated into laboratory animals with positive results.

Rebouças (J.). **Aspergilose niger do conduto.** [Black aspergillosis of the auditory canal.]—*Rev. brasil. oto-rino-laring.*, vii, 2, pp. 169–172, 1939.

Aspergillus niger was isolated on Sabouraud's medium from the auditory canal [*R.A.M.*, xix, pp. 92] of a 30-year-old woman at São Paulo, Brazil, this being apparently the first record of the fungus for the site in question in the country.

Linck (K.). **Tödliche Meningitis aspergillina beim Menschen.** [Fatal meningitis aspergillina in Man.]—*Virchows Arch.*, cccix, 3, pp. 408–419, 4 figs., 1939.

Full clinical details are given of a fatal case of leptomeningitis in a 19-year-old youth at Erlangen, Germany. A species of *Aspergillus* was isolated from the pia mater and is regarded as the primary agent of the disease.

Yamamoto (T.). **Über die Mundhöhlenblastomykosis.** [On blastomycosis of the oral cavity.]—*Oto-rhino-laryng.*, xii, 5, pp. 393–402, 1 pl., 9 figs., 1939. [Japanese, with German summary.]

From persistent abscesses in the oral cavity of a 39-year-old female the writer isolated at the Showa School of Medicine, Tokyo, a species of *Myceloblastanon* [*R.A.M.*, xvii, p. 528], the pathogenicity of which was proved by experiments on laboratory animals.

Ruchman (J.). **Rhinosporidiosis (Seeber) : first occurrence in a female in North America.**—*Arch. Otolaryng., Chicago*, xxx, 2, pp. 239–246, 2 figs., 1939.

Full clinical details are given of a case of rhinosporidiosis (*Rhinosporidium seeberi*) [*R.A.M.*, xviii, p. 800] in a 33-year-old woman at Brooklyn, New York, stated to be the fifty-sixth report of the disease, the eighth for North America, and the first in a female in that country.

Anderson (W. B.) & Byrnes (T. H.). **A case of Rhinosporidium of the conjunctiva.**—*Amer. J. Ophthal.*, Ser. 3, xxii, 12, pp. 1383–1388, 4 figs., 1939.

A fungus presenting the typical features of *Rhinosporidium seeberi* [see preceding and next abstracts] was detected in 1938 in a polypus on the lower left eyelid of a 12-year-old negro boy at the Duke University Hospital, North Carolina, this being apparently the first record for North America of the fungus in the ocular tissue.

Griffey (E. W.). **Rhinosporidiosis : a case report.**—*Amer. J. Ophthal.*, Ser. 3, xxii, 12, pp. 1389–1390, 1939.

A case of rhinosporidiosis [*Rhinosporidium seeberi*: see preceding abstracts] of the right eye in a ten-year-old boy at Houston, Texas, is reported.

Faber (H. K.), Smith (C. E.), & Dickson (E. C.). **Acute coccidioidomycosis with erythema nodosum in children.**—*J. Pediat.*, xv, 2, pp. 163–171, 1939.

This is a report of 24 cases of acute coccidioidomycosis (*Coccidioides*

immitis), personally studied by the authors in children under 15 years of age in the San Joaquin Valley, California [*R.A.M.*, xix, p. 153]. The illness is accompanied by the development of a marked specific sensitivity to the products of the fungus.

RUDDOCK (J. C.) & HOPE (R. B.). **Coccidioidal peritonitis : diagnosis by peritoneoscopy.**—*J. Amer. med. Ass.*, cxiii, 23, pp. 2054–2055, 1 fig., 1939.

Full clinical details are given of a fatal case of coccidioidal peritonitis (*Coccidioides immitis*) [see preceding abstract] in a 35-year-old male Japanese at Los Angeles, California.

EMPEY (W. A.) & SCOTT (W. J.). **Investigations on chilled beef. Part I. Microbial contamination acquired in the meatworks. Part II. Cooling and storage in the meatworks.**—*Bull. Counc. sci. industr. Res. Aust.* 126, 71 pp., 8 graphs; 129, 68 pp., 7 diags., 16 graphs, 1939.

The writers' extensive studies (in progress since 1932) on the nature, extent, and sources of the microbial contamination of beef during its preparation in several Australian meat-exporting works showed that the percentages of yeast and moulds in the −1° C. populations were higher than those of the corresponding groups at 20°. Of the organisms viable at −1°, yeasts were represented by *Mycotorula*, *Candida*, *Geotrichoides*, *Blastodendrion*, and *Rhodotorula*, while the most prevalent mould was *Penicillium*, followed in the order named by *Mucor*, *Cladosporium*, *Alternaria*, *Sporotrichum*, and *Thamnidium* [*R.A.M.*, xviii, p. 255; xix, p. 152]. The extent of contamination of the meat at the conclusion of dressing operations was reduced to about 5 per cent. of its former level by the introduction of hygienic methods. Of the microflora acquired by the beef prior to the initiation of cooling, only the bacteria undergo appreciable changes during this process.

CHAUDHURI (H.). **On resistance of vernalised plants of Linseed to attack by Melampsora lini.**—*Curr. Sci.*, viii, 12, pp. 555–556, 1939.

In experiments conducted by G. Singh linseed seeds T_5 and T_{10} from Lyallpur were given pre-sowing cold treatment and grown in small plots contiguous to the linseed varieties E.B.Z. and O.S.X. from Nagpur. The last two were attacked by *Melampsora lini* [*R.A.M.*, xviii, p. 679] early in March, infection spreading to the untreated T_{10} controls and, a few days later, to the untreated T_5 controls. The treated plants were the last to become affected, and of these, those treated for the longest period (2 weeks, as against 1½ weeks and 1 week in the case of the remainder) showed little or no infection.

MULLER (H. R. A.) & VAN EEK (T.). **Aanteekeningen over eenige ziekten van Roselle en Java-Jute op Java.** [Notes on some diseases of Roselle and Java Jute in Java.]—*Meded. alg. Proefst. Landb., Batavia*, 32 (*Meded. Inst. PlZiekt., Buitenz.*, 92), 21 pp., 1939. [English summary.]

Roselle (*Hibiscus sabdariffa*) and Java jute (*H. cannabinus*) are subject in Java to infection by two groups of fungi, one causing foot rots and the other stem and leaf diseases, the former being the more

important of the two. Included in the foot rot category are *Pythium perniciosum* [*R.A.M.*, x, p. 346], *Rhizoctonia* [*Corticium*] *solani*, *Sclerotium rolfsii* [ibid., xi, p. 158], and *Phytophthora parasitica* [ibid., xiii, p. 216], of which the last-named is the most troublesome, causing losses of 20 per cent. or more, especially on the green-stemmed varieties of *H. sabdariffa*. It produces a black basal rot, gradually merging into the sound tissue by way of an ill-defined water-soaked zone, and extending upwards for a height of 30 to 35 cm. or up to 1 m. above ground-level. In both these respects the *Phytophthora* rot differs from those due to *C. solani* and *S. rolfsii*, the discolorations induced by which are sharply differentiated from the healthy areas and the height attained by the decay not exceeding 5 cm. Older lesions of *P. parasitica* harbour a rich secondary mycoflora, among which *Fusarium* spp. of the *F.* [*solani* var.] *martii* group predominate. Occasionally in loose, sandy soils the roots may also be attacked by *P. parasitica*, which has further been observed to cause local infections high up on the stem, resulting in unilateral wilting in contrast to the general die-back of the upper portions of the plant following invasion of the stem base or root system. These local infections may proceed either from the lower leaves, which are frequently spattered with spores from the soil during rainy periods, or from contact with diseased plants in plantings where prompt eradication is not practised. Cases have been observed in which one diseased plant contaminated five to twelve adjacent healthy ones. Prophylactic measures should include stringent soil sanitation; the substitution of the relatively resistant *H. cannabinus* for *H. sabdariffa*, especially on foci of previous infection and round inlets of irrigation water where silt (frequently contaminated) is deposited; and arrangements for the gradual infiltration of the irrigation water through trenches on to the plant beds so as to avoid immediate contact with a possible source of infection. Direct control should comprise the early decapitation of infected plants some 10 cm. above the discoloured stem area and the removal of the tops, strewing the stumps with freshly slaked lime and after the harvest uprooting and burning, and soil disinfection with 0·1 per cent. terbolan [ibid., xviii, p. 794]. Diseased stems should be picked out before the crop is retted to avoid contamination of the irrigation water. Unlike the other three agents of root rot, *P. parasitica* is not suppressed to any extent by antagonistic micro-organisms, the mortality percentages in inoculation experiments in sterilized and unsterilized soils being 34·8 and 36·4, respectively, while the corresponding figures for *Pythium perniciosum* were 100 and 38·5 (30·5 in one test), respectively. For the control of the latter organism disinfection with 0·3 per cent. ceresan (5 l. per sq. m.) is recommended. *C. solani* and *S. rolfsii* are both favoured by dry weather with heavy dew formation, their development being restricted under normally humid conditions by the competition of other soil organisms. Direct control is seldom necessary in the case of these two foot rots, but sporadic outbreaks of *C. solani* may be combated by spraying with 1·5 per cent. Bordeaux mixture. Slime disease (*Pseudomonas* [*Bacterium*] *solanacearum*) has not been personally observed by the writers either on rosette or Java jute, both of which, however, have been recorded as hosts of the pathogen in Java and Sumatra by other workers [ibid., vi, pp. 131, 419].

No great economic importance need be attached to the stem and leaf diseases of *H. sabdariffa* and *H. cannabinus* in Java. *Phoma sabdariffae* and *Cylindrocladium scoparium* [ibid., xvi, pp. 209, 756] cause foliar spotting, sometimes accompanied by top rot, while local necrotic lesions on the stem cortex are produced by *F. sarcochroum* [ibid., xi, p. 30] and *Diplodia* sp. *H. sabdariffa* appears to be much more susceptible than *H. cannabinus* to attack by the *F.* spp., the injuries due to which may under certain conditions extend into unilateral cankers 5 cm. in length. After retting these dark blotches remain visible on the fibres to which bark remnants adhere, thereby impairing the commercial value of the product.

Macfarlane (Christina S.). **A rot of Scilla bulbs caused by Penicillium cyclopium Westling.**—*Trans. bot. Soc. Edinb.*, xxxii, 4, pp. 542–547, [1939].

In January, 1938, bulbs of *Scilla campanulata* var. *albida* received in Edinburgh from Holland were found to be rotted, in some cases so badly that growth was impossible; isolations yielded a species of *Penicillium* producing an earthy odour in culture and forming round conidia, 2·9 to 4·1 (average 3·46) μ in diameter, borne in compact chains. The fungus was thought to be *P. cyclopium* Westling [cf. *R.A.M.*, xvi, p. 538], and this identification was confirmed at Baarn, though Westling's fungus had smaller spores (2·6 to 3·2 μ) and seldom emitted the strong earthy odour. Thom (1930), however, refers to a culture received from Biourge and confirmed as *P. cyclopium*, in which this smell was observed.

Infection experiments with bulbs of *S. campanulata* and *S. nutans* demonstrated that infection depended on the presence of a wound, while only one infection occurred in the absence of external moisture and this was short-lived. It is concluded that moisture is necessary for the fungus to establish itself permanently, and high temperature and contact between bulbs are also predisposing factors for attack.

Moore (W. C.). **New and interesting plant diseases. 3. A shoot wilt of Prunus triloba caused by Botrytis cinerea Pers.**—*Trans. Brit. mycol. Soc.*, xxiii, 4, pp. 313–315, 2 pl., 1939.

During the spring of 1936 a few shoots on a *Prunus triloba* var. *floro pleno* bush at Harpenden suddenly wilted after flowering, and it was observed that some of the decaying flower clusters were covered with the fructifications of a *Botrytis*. The one-year-old flowering shoots were mainly affected, but new ones were also attacked. In the flowering shoots the condition was almost always associated with a faded, dying flower or flower cluster, which was generally covered with *Botrytis* fructifications. The bark above and below the bud bearing these flowers was somewhat sunken for a distance of 2 to 3 in. and darker than the surrounding healthy parts. Occasionally the disease had originated at the spot where a stray, wind-blown petal had adhered to an internode of a one-year-old twig. The current season's shoots appeared to be directly attacked at or near the base. The wilted leaves became brown and dry and remained attached to the dead shoots through the season. The disease recurred in 1937 and again in 1939. Isolations in both these

years yielded a *Botrytis* of the *cinerea* group. Inoculations of current season's and second-year shoots through wounds gave rise to typical symptoms in three and seven days, respectively, the fungus being re-isolated from the infected parts.

Two cases of *Botrytis* infection of the stems of *Daphne mezereum* and *Cotoneaster frigida* are also reported.

Pape (H.). **Achtung auf den Begonienmehltau!** [Beware of Begonia mildew!]—*Blumen- u. PflBau ver. Gartenwelt*, xliii, 48, p. 522, 1 fig., 1939.

True mildew of begonias (*Oidium begoniae*) is stated to be spreading in Germany [*R. A.M.*, xv, p. 443] since its first appearance in 1934, both the Lorraine and Elatior types being affected. According to Danish observations [ibid., xii, p. 448] the disease is most prevalent during the short, dark days of December and January. So far the writer has noticed no cases of virulent infection, but reports from Holland [ibid., xvi, p. 299] describe severe damage from shrivelling of the foliage, arrested growth, and failure of flower production. Repeated applications of finely ground sulphur dust, lime-sulphur, lye sulphur (e.g., sulphur mixture 1034), solbar, or colloidal sulphur should give effective control if commenced immediately on the outbreak of infection, all very badly attacked plants being promptly removed and burnt.

Zerova (Mme M.). **Coniothyrium cheiranthi sp. nov.** на **Cheiranthus cheiri L.** [*Coniothyrium cheiranthi* n. sp. on *Cheiranthus cheiri* L.].—*J. Inst. Bot. Acad. Sci. Ukraine, 1939*, 21–22 (29–30), pp. 337–338, 2 figs., 1939. [English summary.]

A description [with a Latin diagnosis] is given of *Coniothyrium cheiranthi* n. sp., isolated from necrotic tissues of wallflower leaves and stems from the gardens of a communal farm at Kamenetz-Podolsk, where it was first observed on a few plants in 1937, becoming very prevalent in the following year. The first symptom of the disease is foliar wilting. Later on extensive brownish-grey lesions with a darker margin develop on the stems and on both sides of the leaves; the entire plant may be stunted, the upper leaves deformed and rolled, and the buds under-developed. Sometimes the plant is ultimately killed. Mature pycnidia developed after 15 days on beer wort agar and the inoculation of healthy leaves with pycnospores gave positive results.

The pycnidia of the fungus are solitary, sometimes in groups of two or three, at first brownish, rounded, with a pointed apex, and immersed, later on black, appressed-round with a depressed apex, semi-immersed, 272–400–430 μ in diameter, with a round ostiole, 32 to 40 μ; the pycnospores are unicellular, ovate, oval, cylindrical, straight, or sometimes asymmetrical, fumaceous, and measure 2·5 to 5 (rarely 6·8) by 1·5 to 2·3 μ.

Zerova (Mme M.). Антракноз **Ligustrum vulgare L.** в УРСР. [Anthracnose on *Ligustrum vulgare* L. in the Ukrainian S.S.R.]—*J. Inst. Bot. Acad. Sci. Ukraine, 1939*, 21–22 (29–30), pp. 325–332, 5 figs., 1939. [English summary.]

A serious disease of privet was observed during 1938 causing die-

back of 60 to 70 or up to 100 per cent. of seedlings and two- to three-year-old plants in two nurseries near Kieff. The plants wilt rapidly, the leaves usually turning yellow and then brown, but in dry, hot weather the leaves wither when still green. Brown, round spots, sometimes with a definite margin, often appear on both sides of the leaf blade. The fungus causing the disease was identified as *Colletotrichum gloeosporioides* [the conidial stage of *Glomerella cingulata*: *R.A.M.*, ix, p. 654]. The fructifications of the fungus were observed in many instances to give rise to pycnidia of the *Phoma* type, and this stage is regarded as a new fungus and named *P. lavitskii* n. sp. [with a Latin diagnosis]. It is characterized by semi-immersed, subglobose, black pycnidia, 120 to 175 μ in diameter, sometimes provided with brown setae and a rounded ostiole, and ellipsoid or ovoid conidia, measuring 3·5 to 5·1 by 2·2 to 2·5 μ.

METCALFE (G.). **A bacterial disease of Forsythia.**—*Nature, Lond.*, cxliv, 3660, p. 1050, 1939.

The two-year-old branches of *Forsythia spectabilis* and *F. intermedia* in an East Anglian nursery were found on examination at the Botany School, Cambridge, to be suffering from a disease causing partial or complete failure of the flowers, the buds either remaining dormant or opening imperfectly. Sections through the apparently healthy shoots revealed a scarlet to dark brown, usually crescent-shaped stain in the wood. On any bush, healthy and diseased shoots arise from different stools. Excision of the infected branches (but not of the diseased stools) failed to control the die-back, indicating that the pathogen can spread from diseased to sound stools. The green-fluorescent bacterium isolated on beef infusion agar and Uschinsky's solution from the discoloured wood was found to be closely related to *Pseudomonas syringae*, previously reported by Wormald as probably causing a disease on the same host [*R.A.M.*, xv, p. 703]. Inoculation experiments on young, succulent lilac [ibid., xviii, p. 257] and *Forsythia* shoots gave positive results.

PRETI (G.). **L'"Oidium acrocladum" Ferr. riscontrato sulle diverse specie di 'Stapelia' coltivate nella riviera ligure occidentale.** [*Oidium acrocladum* Ferr. found on various species of *Stapelia* cultivated on the western Ligurian Riviera.] —*Riv. Pat. veg.*, xxix, 9–10, pp. 423–427, 2 figs., 1939.

In June, 1937, the author observed that *Stapelia variegata*, *S. grandiflora*, *S. bergeriana*, *S. gigantea*, *S. viscolor*, *S. hirsuta*, *S. longipedicellata* var. *kwebensis* [*S. longipedicellata*], *S. nobilis*, and *S. mutabilis* growing in a cold greenhouse in San Remo showed the presence of a fungus identical with *Oidium acrocladum* [*R.A.M.*, xvii, p. 324] on the extremities of the branches. The evidence indicated that infection is favoured by hot, wet conditions and lack of direct sunlight. Plants showing early infection recovered after being placed in the sun and kept without being watered. It is recommended that badly affected plants should be removed, the remainder placed in the sun, and the greenhouse thoroughly ventilated. Sulphur is also stated to be effective against the fungus.

Sampson (Kathleen). **Additional notes on the systemic infection of Lolium.**—*Trans. Brit. mycol. Soc.*, xxiii, 4, pp. 316–319, 1939.

Continuing her studies on the endophytic fungus of *Lolium* spp. [*R.A.M.*, xvii, p. 251], the author observed mycelium in *Festulolium loliaceum* (Huds.) Hubbard (syn. *Festuca loliacea*). Systemic infection of this plant, of which this is the first record, is in conformity with its supposed origin as a natural hybrid between *F. pratensis* and *L. perenne*.

A number of fresh isolations were made from plants of *L. perenne* of different origin, but these and the isolates from the hybrid remained sterile, like the original types, providing no further clue to the identity of the fungus or fungi concerned. The distinguishing features of the two types of mycelium isolated from *L. perenne* (endophytes 1 and 2) [loc. cit.] are tabulated.

Cultures from *Festulolium loliaceum* fell into two groups, those from Middlesex and Montgomeryshire resembling endophyte 1, and those from Oxfordshire and Wiltshire agreeing with endophyte 2. In one instance, the mycelium in a large piece of pith from a plant from Montgomeryshire gave appreciable growth on agar, the fungus being isolated when transfer was made to egg. This is the only occasion when endophyte 1 has been isolated when pith was placed directly on an agar medium. In the plants from Oxfordshire and Wiltshire, the mycelium in the pith was sparsely branched and deeply staining, like that of endophyte 1 in perennial rye grass No. 1971. The distribution of mycelium in the most mature ovaries agreed with that in perennial rye grass No. 1971, darnel, and related species.

Of 42 plants of *L. perenne* only five were systematically infected, the endophyte being isolated from each. Two plants from Aberystwyth and Norfolk carried endophyte 1 and one plant from Lincolnshire contained endophyte 2. Two other plants from Lincolnshire and Norfolk carried mycelium in the stems and seed resembling endophyte 1, these strains corresponding with those found in *F. loliaceum* from Oxfordshire and Wiltshire.

The mycelium in *L. multiflorum* failed to grow on artificial media, agreeing in this and other respects with that found in *L. temulentum* and *L. remotum*.

Crosier (W.). **Occurrence and longevity of Ascochyta pisi in seeds of Hairy Vetch.**—*J. agric. Res.*, lix, 9, pp. 683–697, 4 figs., 1939.

In studies carried out at Geneva, New York, 181 seed samples of hairy vetch (*Vicia villosa*) imported in 1929 and 1930 and 110 samples imported in 1931 and 1932 yielded *Ascochyta pisi* [*R.A.M.*, xvii, p. 15] in 1 and 16 samples, respectively, on culturing in 1934. When a total of 224 samples of both American and imported crops of 1931 to 1937, inclusive, were tested immediately after their receipt, 149 of the samples were found to be infected internally, but during storage in a warm, dry laboratory for one to five years the number of infected samples decreased continuously, the fungus apparently losing its viability in heated storage within four or five years (very rarely six or seven). The viability of the seed, on the other hand, remained nearly constant for four years or more, thus suggesting prolonged storage as a means of controlling the fungus. Seeds are infected through the pods and disease-

free seeds can be obtained by pod selection; on the other hand, the presence of pod spots does not always indicate that the seeds are infected, only 5·1 per cent. of the seeds of commercial size from pods with lesions being found to contain *A. pisi*. The fungus may permeate all parts of severely infected seeds, but is most usually limited to the seed coat and cotyledons. Exposure to hot air and water was more dangerous to seeds than to either the spores or mycelium of the fungus. New ceresan alone of all the chemicals tested reduced, but did not eliminate, the fungus content in seeds during a two-year storage period. Other fungi isolated, although infrequently, from seeds of *V. villosa* were *Alternaria* sp., *Fusarium* spp. [ibid., xviii, p. 831], *Rhizoctonia* [*Corticium*] *solani* [loc. cit.], and *Xylaria* sp. *A. pisi* was found in a few samples of several species of *Vicia*, but was not recovered from any of 21 seed stocks of *V. sativa*.

Reichert (I.). **Palestine : diseases of fruiting plants (except Citrus).**—*Int. Bull. Pl. Prot.*, xiii, 12, pp. 277–293, 1939.

A preliminary list is given of the fungal, bacterial, virus, and physiological diseases occurring on fruit plants other than citrus in Palestine, and studied at the Rehovoth Agricultural Research Station, Palestine, from 1923 to 1938 [cf. *R.A.M.*, xviii, p. 518; xix, pp. 73, 134].

Hildebrand (E. M.). **Fire blight and its control.**—*Ext. Bull. Cornell agric. Exp. Sta.* 405, 32 pp., 23 figs., 1939.

A popular account is given of the symptoms, causal organism, manner of spread, and control of fireblight disease (*Erwinia amylovora*) of fruit trees [*R.A.M.*, xviii, pp. 685, 725, 786] in New York.

Tiller (L. W.) & Cooper (E. R.). **X-ray detection of mouldy-core in the Delicious Apple.**—*N.Z.J.Sci. Tech.*, xxiA, 3, pp. 168–169, 1 fig., 1939.

An acute recurrence of mouldy core of Delicious apples in the Auckland district of New Zealand [*R.A.M.*, xviii, p. 687] during the 1936 season, reducing the potential export from 30,000 to under 5,000 bush., prompted an investigation of the possibilities of detecting the trouble by means of X-rays. The results of a series of observations with X-rays generated at 6·5 ma. and 75 kv. showed that the average time for the inspection of twelve apples could not be reduced to much below three minutes, at which rate the number of errors made was of the order of 20 per cent., chiefly in the mildly affected fruit. Considering that the cost of a commercial X-ray unit (ten of which would be required for the Auckland district) is in the region of £1,000 and that it would be necessary to work at full pressure for a month at three times the speed indicated above in order to handle 30,000 cases, the irradiation method can scarcely be regarded as commercially practicable.

Müller (J. A.). **Über im Tauchverfahren zwecks Verlängerung der Lagerdauer behandelte Äpfel. Bestimmung der von der Apfeloberfläche abwaschbaren Anteile.** [On Apples treated by the immersion process for the prolongation of the storage period. Determination of the proportions liable to be washed off the skin.]—*Vorratspflege u. LebensmittForsch.*, ii, 11–12, pp. 685–693, 1939.

The amounts of the three mineral oils 2243, 2252, and 2253, recently

used in experiments in Germany in the preservation of apples during cold storage [primarily against *Gloeosporium album*: *R.A.M.*, xviii, p. 533], adhering to the fruit after washing were found in experiments at the Hygienic Institute of Halle University to be too minute to possess any physiological or pharmacological significance.

PERLBERGER (J.). **Entomosporium maculatum on Pears.**—*Palest. J. Bot.*, R Ser., ii, 2, pp. 289–291, 1 fig., 1939.

Attention is drawn to the appearance of *Entomosporium maculatum*, the conidial stage of *Fabraea maculata* [*R.A.M.*, xix, p. 30], in the spring of 1939 in four pear nurseries in northern Palestine. All the diseased trees originated in the Government nurseries at Acre and were grafted on *Pyrus syriaca* stocks.

KIENHOLZ (J[ESS] R.). **Comparative study of the Apple anthracnose and perennial canker fungi.**—*J. agric. Res.*, lix, 9, pp. 635–665, 9 figs., 1 map, 1939.

The results of comparative morphological and physiological studies of the closely related fungi, *Neofabraea malicorticis* [*R.A.M.*, xviii, p. 532] and *Gloeosporium perennans* [ibid., xviii, p. 762], causing apple anthracnose and perennial canker, respectively [cf. ibid., xii, p. 299], failed to show a constant specific distinction between the two species, although the cankers produced by them are quite distinct. Anthracnose occurs generally in the humid regions to the west of the Cascade Range, and perennial canker is found in the dry zones to the east; both diseases occur in certain overlapping areas, and conidia collected there are of an intermediate type. In artificial inoculations a great number of hosts were equally susceptible to both fungi. On standard cultural media greater variations often occurred between the different strains of a species than between the species themselves. The addition of copper sulphate (in concentrations of 0·05 and 0·1 per cent.) to the media reduced the growth of most strains of *G. perennans* to a greater degree than that of *N. malicorticis*; in the orchard, on the other hand, copper sprays effectively controlled the anthracnose fungus but had little effect upon the perennial canker. Both fungi produced sectors in culture.

The results of parallel inoculations with parent and mutant strains strongly suggest that the two diseases are caused by strains of a single fungus that might have arisen by mutation. Conidia produced by either fungus in artificially infected apple fruits were of the perennial canker type. During 1928 and 1929 J. S. Cooley observed an Ascomycetous fungus which proved to be the apothecial stage of *G. perennans*. The present author, in 1932, found apothecia on artificially-induced cankers of *G. perennans* and accordingly names the fungus *N. perennans* [with diagnoses in Latin and English]. It differs from *N. malicorticis* in having slightly smaller asci and ascospores and mostly straight or slightly curved conidia. The asci measured 8·5 to 19·5 by 50 to 142 (mean 12·6 by 98·1) μ, the ascospores 4·2 to 8·5 by 11·5 to 22·7 (mean 6 by 17·7) μ, and the conidia 3 to 6 by 12 to 25 μ. The separation of these fungi into two species is based chiefly on their pathological differences.

Leishman (E.). **Brown rot (Sclerotinia fructicola) of stone fruit.**—*J. Dep. Agric. S. Aust.*, xliii, 3, pp. 196–201, 6 figs., 1939.

Brown rot of stone fruits (*Sclerotinia fructicola*) is stated to have been of little economic importance in South Australia until 1936–7, when apricots in the south-east and cherries in the Mount Lofty Ranges were attacked, the latter in a very severe form entailing heavy losses of fruit. In control experiments on four plots of five trees each of the William's Favourite, Beauchamp's Black, and St. Margaret cherry varieties showing 10, 5 to 10, and 15 per cent. blossom blight, respectively, the best results were given by a schedule comprising one application of Bordeaux mixture (6–4–40) on 14th August (given to all the trees) and two of lime-sulphur (1 in 80), one on 14th October and the second on 1st November, which completely eliminated infection. The other schedules, involving the omission of the second, the first, and both lime-sulphur treatments, respectively, were less successful (the first only slightly so), with 0·8, 2·2, and 6·8 per cent. brown rot, respectively [cf. *R.A.M.*, xviii, p. 785]. The first programme, supplemented by stringent orchard sanitation, is accordingly recommended for the control of the disease on cherries. No tests have yet been carried out on apricots.

Hull (R.). **Study of Byssochlamys fulva and control measures in processed fruit.**—*Ann. appl. Biol.*, xxvi, 4, pp. 800–822, 2 graphs, 1939.

From the survey of various fruit-producing areas in England it is concluded that *Byssochlamys fulva* [*R.A.M.*, xix, p. 24] develops in the field on fruit refuse, particularly on mummified plums, during the summer months, the ascospores being later disseminated by air. Under laboratory conditions the majority of ascospores did not survive a short exposure to 85° C., and at 96° all spores were killed within 9 minutes. Conidia were killed after heating for 10 minutes at 70°. The optimum temperature, both for mycelial growth and for ascospore germination, was about 35°. The germination of ascospores was stimulated by previous heating to about 70°, and ascospores pre-heated for 20 minutes at 75° germinated more rapidly on agar plates with a sucrose concentration of 20 per cent. than on plates with either 0 or 40 per cent. sucrose. The asci were relatively insensitive to fungicides and to concentrations of carbon dioxide below 60 per cent. A pectin-destroying enzyme extracted from the mycelium of the fungus was found to cause a rapid distintegration of the tissue of canned fruits. In canning experiments with naturally infected fruit the infection was controlled by heating the contents to 195° F. The amount of mycelial growth in an infected can was greater with increasing head space.

Stout (G. L.). **Peach mosaic.**—*Bull. Dep. Agric. Calif.*, xxviii, 3, pp. 117–200, 10 figs., 1939.

In this paper the author gives a full account in semi-popular terms of the history, symptoms, transmission, spread, and control of peach mosaic [*R.A.M.*, xvi, p. 543; xviii, pp. 78, 260], based partly on the available literature and partly on the results of three seasons' intensive field work in southern California. The following items may be noted.

Different peach varieties show marked dissimilarity in severity and type of symptom expression. Rio Oso Gem and Fay Elberta exhibit all five known groups of symptoms, viz., colour-breaking, retarded foliage development, leaf mottle and deformity, fruit deformity, and abnormal twig growth; Hale and Elberta show all except colour-breaking, while Florence and Mayflower present pronounced blossom symptoms, but show others mildly. All varieties produce leaf symptoms, but individual trees may fail to show definite symptoms during the growing season. In the dormant season the disease is recognizable in the field only on those varieties showing marked twig abnormalities. Affected petals are sometimes crinkled and dwarfed. Foliage retardation may persist into summer. Many of the first leaves drop when severely affected, and later ones may appear more normal. In California, veinlet-clearing is sometimes very pronounced throughout individual trees of a few varieties, but as it tends to disappear rapidly it is useful as a diagnostic symptom chiefly very early in the season. The yellow markings may be closely associated with the midrib or lateral veins. Very often a feathery, elongated, irregular yellow band is visible along a vein. Affected fruits may ripen more than a week after normal ones. So far the disease has only been transmitted by budding or grafting but unknown insect vectors may be responsible for its rapid natural spread.

During 1938, approximately 18,000 new infections were found in southern California, this figure amounting to about one-half that for 1937 [ibid., xvii, p. 798]. Between the beginning of the eradication campaign in 1936 and February 1939, approximately 81,000 diseased trees were found, of which nearly 63 per cent. were removed. Some 200,000 abandoned peaches, including 20,000 abandoned nursery trees, have also been removed.

Boyd (O. C.). **Distribution of X-disease of Peaches in Massachusetts.**—*Plant Dis. Reptr*, xxiii, 21, pp. 341–342, 1939. [Mimeographed.]

Details are given of the prevalence of the X-disease (yellow-red virosis) of peach and chokecherry (*Prunus virginiana*) [*R.A.M.*, xviii, p. 401] in Massachusetts in 1939. In general, the disorder was much more widespread in the southern than in the northern half of the State. The actual and potential gravity of the situation is emphasized.

Meredith (C. H.) & Butler (A. F.). **The production of Cercospora musae conidia in Banana-leaf agar.**—*J. Jamaica agric. Soc.*, xliii, 12, p. 621, 1939.

Conidia of *Cercospora musae* were obtained in culture on banana leaf extract agar, using water distilled in pyrex glassware, no copper being allowed to come in contact with the medium. The conidia for seeding were taken directly from infected leaves kept in moist conditions for 15 to 20 hours.

Zillig [H.] & Ehrke [G.]. **Gerät zur Spritzbrühenbereitung nach System Willmes-Kreutzenberger und Spritzbrühenmischanlage mit Zapfhaus, Bauart Willmes der Firma Josef Willmes, Mannheim, Kaiserring 38 (Einzelprüfung).** [Spray preparation equipment on

the Willmes-Kreutzenberger lines and spray-mixing depots with 'pivot house', construction by Willmes of the firm Josef Willmes, Mannheim, Kaiserring 38 (First trial).]—*Masch. u. Geräteprüf. Reichsnährst.* (Suppl. to *Tech. in d. Landw.*), iv, 12, pp. 103–104, 2 figs., 1 diag., 1939.

Full details are given of the construction and application of the 'Mix' apparatus for the preparation on behalf of co-operative concerns of Bordeaux mixture and other fungicides used in the vineyard.

Schmidt (H.). **Gemeinschaftliche Spritzbrühmischanlagen.** [Co-operative spray-mixing depots.]—*Obst- u. Gemüseb.*, lxxxv, 11, pp. 118–119, 1 fig., 1 diag., 1939.

Particulars are given of the co-operative spray-mixing depots in course of erection or already completed in the viticultural and fruit-growing regions of Germany. The fungicides are supplied to the growers at cost price; in 1938 the total amount used at Meckenheim (Palatinate) was 800,000 l. and in 1939 (until the autumn) over 1,000,000 l., sufficient to cover the 150 hect. of vineyard and 55,000 fruit trees within the parish bounds. The Willmes 'Mix' apparatus [see preceding abstract] is also applicable for similar purposes on a smaller scale.

Hayden (J.). **A home-made spraying mask.**—*Agric. Gaz. N.S.W.*, l, 12, p. 678, 1 fig., 1939.

A cheap, simple, and effective mask to protect the face from irritating sprays is described, consisting of a straw hat to the rim of which is sewn a veil about 12 in. deep made of blind holland or other waterproof material, with a cut about 6 by 8 in. in front into which is sewn a piece of celluloid.

Dickson (J. G.). **Outline of diseases of cereal and forage crop plants of the northern part of the United States.**—vii+259 pp., Burgess Publishing Company, Minneapolis, Minn., 1939. [Mimeoprinted.] $3.

This outline of diseases of cereals and forage crop plants in the northern areas of the United States aims at presenting the more important relevant information in a convenient form and is not intended to be a complete treatise on the diseases in question. The diseases are grouped under the hosts concerned, viz., barley, maize, oats, rye, sorghum and millet, wheat, flax, lucerne and sweet clover, clovers, and soy-bean. The notes deal with such matters as hosts, geographical distribution, economic importance, symptoms, pathological histology, causal organism, and control. Bibliographical references are given for each disease and total over 2,500 items.

Holmes (F. O.) **Handbook of phytopathogenic viruses.**—vii+221 pp., Minneapolis, Minn., Burgess Publishing Company. [Mimeoprinted.] $2.

In this useful publication the author has collected together and condensed the essential information regarding 129 plant viruses, which he here discusses under their common and new Latin binomial names as

a more detailed illustration of his proposed system for the classification and nomenclature of viruses [*R.A.M.*, xviii, p. 607]. The data for each virus are summarized under the following headings: synonyms, susceptible and insusceptible species, geographical distribution, induced disease [symptoms], transmission, serological and immunological relationships, thermal inactivation, filterability, other properties, and control. Select bibliographies are appended. The book concludes with particulars of certain bacteriophages, fairly complete lists of plants susceptible to the viruses of aster yellows, beet curly top, tobacco mosaic, cucumber mosaic (cucumber virus 1), and tomato spotted wilt, a list of 51 viruses still inadequately described, and an index.

Watson (M[arion] A.) & Roberts (F. M.). **A comparative study of the transmission of Hyoscyamus virus 3, Potato virus Y, and Cucumber virus 1 by the vectors Myzus persicae (Sulz), M. circumflexus (Buckton), and Macrosiphum gei (Koch).**—*Proc. roy. Soc.*, Ser. B, cxxvii, 849, pp. 543–576, 1 pl., 1939.

The results given in this paper support the previously proposed hypothesis [*R.A.M.*, xvii, p. 344] that one of the main factors in the complex relationship between the non-persistent viruses and their vectors is the inactivation of the viruses by a substance produced by the vectors when feeding. The efficiency of the three vectors used, viz., *Myzus persicae*, *M. circumflexus*, and *Macrosiphum gei* [*M. solanifolii*], in transmitting all the viruses tested (three strains of *Hyoscyamus* virus 3, two of cucumber virus 1, and potato virus Y) was shown to increase with increasing time of fasting before feeding on the infected plants, and to decrease as the time of feeding on the infected plants was prolonged. The substance which is thought to inactivate the virus appears to be produced by all the vectors, though in varying quantities, and all the viruses tested seemed to be affected in a similar manner. On the whole the most efficient vector was *M. persicae* and *M. solanifolii* the least so, but their relative efficiency varied with the different viruses, being apparently influenced, apart from the infectivity of the virus, by the concentration and the localization of a given virus in the host plant, and the capacity of the vector for inactivating the virus.

Since the three viruses thus shown to have similar insect-virus relationships are also similar in many of their physical properties, it is suggested that such viruses may form a natural group, with the same type of vector-virus relationship. The opinion is expressed that mechanical transmission of these viruses by insects is very unlikely, judging by the foregoing results.

Weiss (F.). **A key to the typical viruses of leguminous crops.**—*Plant Dis. Reptr*, xxiii, 22, pp. 352–361, 1939. [Mimeographed.]

In presenting this annotated key to some typical virus diseases of leguminous crops the author states that if K. M. Smith's book on plant virus diseases [*R.A.M.*, xvii, p. 52] could be accepted by international agreement as a basis for virus nomenclature, the appropriate 'generic' reallocations, transfers to synonymy, and additions of new names would present no insuperable difficulties, but even tentative agreement on virus names seems unlikely in the near future [cf. ibid., xviii,

pp. 606, 607]. Pending the adoption of international rules of nomenclature for plant viruses, and in order to systematize the records, the Plant Disease Survey is preparing an index of viruses and virus diseases occurring in the United States, and the present paper is the first of a series of studies projected to this end. As a tentative basis, Smith's system of classification and nomenclature is being followed, but with variations agreed upon by the Survey staff and the virus specialists consulted. It is hoped to build up a system of virus nomenclature that may prove widely acceptable as a standard in the United States, making broad provision for synonyms and common names and for elasticity of revision.

The principles followed are these: the formal virus name is to consist of (*a*) the Latin generic name of the first described or the most important host, (*b*) an Arabic numeral indicating its chronological order in the discovery and formal description of the viruses especially affecting this host, and (*c*) the name of the author of the type description, e.g., *Phaseolus* virus 2, Pierce.

Notes are given on the interpretation of the key (which covers beans, peas, clovers, and lucerne), and the paper concludes with a bibliography of 29 titles.

HARLEY (J. L.) **Beech mycorrhiza : reisolation and the effect of root extracts upon Mycelium radicis fagi (Chan).**—*New Phytol.*, xxxviii, 4, pp. 352–363, 1 fig., 1 diag., 3 graphs, 1939.

In continuation of his studies on beech mycorrhiza [*R.A.M.*, xvii, p. 54] the author isolated from the 'pyramidal' type of infection [loc. cit.] a fungus closely resembling *Mycelium radicis fagi* [ibid., ii, p. 463]. In view of the difficulty of obtaining pure cultures of the fungus a special technique was used, by which the infected roots were first washed with sterile distilled water and then placed in a washing apparatus of original design, where they were immersed for 30 seconds in 10 per cent. bromine water and then shaken by a motor apparatus in a continuous current of distilled sterile water for several hours. Several pure or nearly pure cultures have thus been obtained. The growth in pure culture was strikingly slow, the fungus was incapable of attacking amide or amino nitrogen with any readiness, and the rate of respiration as measured by carbon dioxide emission was very low. The growth was stimulated, however, by the addition of extracts of beech roots, which were found to be a mixture of substances containing, very probably, a catechol tannin and oxidase enzyme system and very little nitrogen and carbon, the stimulation amounting in various sets of experiments to from 400 to 800 per cent. The stimulating property of the extract was not destroyed by heat or kaolin. Since the contents of nitrogen and carbon in the extract are very small, it is believed that the extract does not act as a source of nutriment, but provides some form of relatively heat-stable accessory food factor. Experiments on reinfection of beech with the organism are in progress.

BURGES (A.). **The defensive mechanism in Orchid mycorrhiza.**—*New Phytol.*, xxviii, 3, pp. 273–283, 1 pl., 1 fig., 1939.

The invasion of orchids by mycorrhizal fungi [*R.A.M.*, xvi, p. 446]

takes place through root hairs or more rarely by direct penetration of the epidermis, the latter being the most common method in *Gymnadenia conopsea*. Hyphae invade the middle cortex, but they are, however, soon destroyed by a defensive mechanism of the plant, which seems to operate more actively in the tubers, stems, and leaves than in the roots, to which the fungal infection is usually limited. Two types of resistance can be distinguished, a mechanical, in which the cell walls become thickened (by a layer up to 6 or 7 μ thick) and turn yellow, undergoing probably some form of excessive cuticularization; and a protoplasmic resistance, in which the invading hyphae are completely broken down by what appears to be the action of proteolytic enzymes, to a more or less homogeneous yellowish mass in the centre of the host cell. When the fungal hyphae from the roots of *Orchis incarnata* were dissected by means of a micro-manipulator and transferred to agar or plasmolysed, it was concluded that during the early stages of infection the hyphae are capable of further growth, and that as the histological changes become apparent the fungus gradually loses its vitality. The addition of small quantities of extracts from tubers, stems, leaves, and roots of orchids to young cultures of the endophytic fungus resulted in all cases in an inhibition of fungal growth and the complete decomposition of hyphae within three or four days, root extracts being much less toxic than those prepared from tubers or stems. Sap of host cells withdrawn by means of a micro-pipette and added to blocks of agar smear cultures produced visible changes in the hyphae within 24 hours, and at the end of four days some empty hyphae could be seen. Extracts withstood heating for five minutes at 50° C., but were inactivated when heated for a similar period at 60°.

An interesting observation was made by the author on roots of *O. incarnata* exposed to light so that they could develop chlorophyll: the root cells on the upper side were found to possess chloroplasts and showed no trace of infection, while those on the lower side were infected, indicating that the formation of chlorophyll is accompanied by immunity from infection.

Bawden (F. C.) & Pirie (N. W.). **The purification of insect-transmitted plant viruses.**—*Brit. J. exp. Path.*, xx, pp. 322–329, 1939.

Liquid crystalline preparations of nucleoproteins were obtained from White Burley tobacco plants infected with the insect-transmitted potato virus Y [*R.A.M.*, xviii, pp. 60, 472], using the following method. Plants were cut down about a month after infection, minced, the sap expressed and clarified, and then centrifuged repeatedly, ammonium sulphate being added; at one stage the precipitate was dialysed and again centrifuged. The final yield varied between 0·5 and 1·5 mg. per l. of infective sap. In their general physical properties these preparations resembled those of potato virus X [ibid., xix, p. 48], but were more readily denaturated by heat, acid, and ageing. They showed anisotropy of flow, and gave specific precipitates of the flagellar type with antisera when diluted to 1 in 10^6. The purification process seemed to render much of the virus non-infective without destroying its serological activity, but as the virus does not give countable local lesions, accurate quantitative tests of its infectivity could not be made. Purified pre-

parations of the virus were not inactivated by freezing and thawing; they retained their infectivity and their optical properties for some weeks when kept cold, but at room temperatures both were lost in a few days. In crude sap the virus was destroyed at hydrogen-ion concentrations above P_H 5, but in purified preparations these had no effect, whereas after 3 hours at P_H 9·2 the virus was non-infective but still retained one-half of its serological activity, which was quite lost after the same time at P_H 10·3. The purified preparations contained 14 to 16 per cent. of nitrogen and from 0·3 to 0·5 per cent. phosphorus. The most usual impurity was a complex, containing both lipoid and carbohydrate [the chief properties of which are described].

Similar methods of purification were used with the *Hyoscyamus* virus 3, also insect-transmitted [ibid., xviii, p. 202], and the material obtained (about 1 to 3 mg. per l. of sap) showed anisotropy of flow and general properties essentially similar to those of virus Y. The two viruses are, however, not related, for antisera prepared against one did not react with the other.

Salaman (R. N.) & Wortley (W. R. S.). **Potential hosts of Potato viruses in garden and field.**—*Nature, Lond.*, cxliv, 3660, pp. 1049–1050, 1939.

In 1938 potato leaf roll was successfully transmitted by means of grafts at the Potato Virus Research Station, Cambridge, to *Matthiola* and *Campanula*, both of which acted as carriers. In the following year the same disease was conveyed by grafting from potato to turnip and back to a President potato, and by *Myzus persicae* [cf. next abstracts] from potato to Brussels sprouts and back to potato. Neither crucifer showed any symptoms, but the virus recovered in the Presidents caused a typical leaf roll in the former case and an ill-developed and ambiguous syndrome in the latter. An unexpected complication, however, arose through the fact that in a number of instances the virus carried over to the potato and thence to tobacco or *S*[*olanum*] *glutinosum* from infected *Brassica* spp. or other extraneous hosts was not leaf roll but Y. On close examination this virus was found to be harboured by the experimental potatoes, which had exhibited acute leaf roll for nearly 20 years without a trace of the typical Y symptoms. It was ascertained that the Y virus can be carried in a masked form by turnips, cabbage, kale, Brussels sprouts, red clover [*Trifolium pratense*], garden peas, and bindweed [*Convolvulus avensis*], and conveyed from crucifers to potatoes by grafting or with the aid of *M. persicae*, and thence to tobacco and *S. glutinosum*. *B.* spp. frequently serve as overwintering hosts for *M. persicae* [*R.A.M.*, xvi, p. 551 *et passim*], and it is suggested that they and the almost ineradicable bindweed may also act as reservoirs during the cold season for the destructive potato viruses under discussion.

Quanjer (H. M.). **De Perzikbladluis, een gevaar voor de cultur van Aardappelen en andere gewassen.** [The Peach aphid, a threat to the cultivation of Potatoes and other crops.]—*Tijdschr. PlZiekt.*, xlv, 5, pp. 224–232, 1939.

In connexion with a recent study by H. R. Lambers (*Landbouwk.*

Tijdschr., Wageningen, 1, 619, 1938) on the life-history of the peach aphid (*Myzus persicae*), the writer summarizes other outstanding contributions to the knowledge of the biology of the insect, with special reference to its activities as a vector of virus diseases of potatoes [*R.A.M.*, xviii, pp. 131, 133, 578, *et passim*] and other crops. The virtual absence of serious virus diseases from Estonia, according to a recent report by W. Roots to the Dresden Agricultural Congress, 1939, places the potato trade of that country in a very favourable position; among the factors contributing to the healthy condition of the crops are the low mean annual temperature (4·9° C. as compared with 9° in Holland), the intensive breeding and selection work in progress at Jögeva, and the stringent enforcement of quarantine regulations for imports. The possibility of reducing aphid infestation in Holland by the official restriction of peach- and apricot-growing is briefly considered.

Kramer (M.). **A degenerescência e a defesa da cultura da Batatinha.** [Degeneration and the defence of Potato cultivation.]—*Biologico*, v, 12, pp. 265–272, 1939.

Following a brief survey of the various theories advanced in explanation of the problem of potato degeneration, the author discusses the possibilities of combating the trouble in the Argentine and suggests four general measures of control, viz., (1) the stimulation of vigorous growth by spraying against insects and fungi; (2) the procurement of seed from mountainous regions where humid conditions and strong winds prevail during the growing period [cf. preceding and next abstracts]; (3) the extirpation of foci of infection by clean cultivation, crop rotation, elimination of susceptible wild Solanaceae, and prompt roguing of suspected individuals in stands destined for seed; and (4) the use of certified seed from an approved source [see next abstract].

Silberschmidt (K.). **A pratica da produção de tuberculos-sementes de Batatinhas do país.** [The practice of the production of seed tubers of home-grown Potatoes.]—*Biologico*, v, 12, pp. 279–284, 1 fig., 1939.

A co-operative society having been founded in the Argentine for the production of home-grown seed potatoes, the writer discusses the practical measures to be taken to secure the success of the project. Seed should be procured from a reliable source, either from a healthy zone such as Cotia, or from Holland or Germany, and planted out in a suitable locality, for instance, the mountainous region of Cascata, where the humid climate is particularly favourable for this purpose [see preceding abstract].

In addition to the three European varieties commonly cultivated in the Argentine, viz., Eigenheimer, Bintje, and Konsuragis, a considerable trade is carried on with indigenous stocks. The Argentine potatoes suffer severely from degeneration, the incidence of which may amount to over 50 per cent. [*R.A.M.*, xvii, p. 266], but they possess valuable commercial qualities and fetch high prices on the Rio de Janeiro market. In their cultivation it is absolutely necessary to practise rigorous roguing. Directions for the control of virus diseases include the eradication from the vicinity of the breeding plots of all other Solanaceae and

the restriction of cultivation of peaches and other crops (e.g., crucifers, curcurbits, and beans [*Phaseolus vulgaris*]) liable to harbour aphids. In order to prevent the transmission of infection by aphids from diseased to healthy tubers in storage, the rooms should be fumigated, while the potatoes are still in the dormant state, with 98 per cent. nicotine, using a minimum quantity of 2·5 c.c. per 10 cu.m.

Boyd (O. C.). **Two diseases of Potato newly reported from Massachusetts.**—*Plant. Dis. Reptr*, xxiii, 19, p. 322, 1939. [Mimeographed.]

During the autumn of 1939, potatoes in Massachusetts were affected by bacterial wilt and soft rot, presumably due to *Bacterium sepedonicum* [*R.A.M.*, xix, p. 114], a severe case of pink rot (*Phytophthora erythroseptica*) [ibid., xix, p. 40] occurring elsewhere in the same State. This is stated to be the second report of potato pink rot in the United States.

Eddins (A. H.). **Some characteristics of bacterial ring rot of Potatoes.**—*Amer. Potato J.*, xvi, 12, pp. 309–322, 5 figs., 2 diags., 1939.

This is a discussion of the similarities and differences between bacterial ring rot (*Phytomonas sepedonica*) [*Bacterium sepedonicum*: see preceding abstract] and brown rot (*P. solanaceara*) [*Bact. solanacearum*] of potatoes [*R.A.M.*, xviii, p. 473], supplemented by recent information on seed and soil transmission and the influence of environmental factors in connexion with the former disease in Florida.

Climatic conditions limit the occurrence of brown rot in the United States to areas situated in the south Atlantic and Gulf Coast States from Maryland to Texas, and in Pennsylvania, Ohio, Illinois, West Virginia, and Kentucky, whereas bacterial ring rot appears to develop without restriction in any part of the country as well as in Canada. Both diseases are seed-borne, but brown rot is not usually transmitted in this way, since the seed used in most sections of the States is produced in localities from which *Bact. solanacearum* is absent. Both pathogens generally cause partial or complete wilting, but in the case of ring rot the mottled leaves roll upwards before wilting and dying, whereas in that of brown rot the faded foliage collapses and turns brown without mottling or rolling. There are no stem symptoms of ring rot comparable with the brown vascular discoloration typical of brown rot. Tuber ring rot is induced by both organisms, accompanied in the case of *Bact. sepedonicum* by a reddish-brown discoloration of the skin and sometimes by cracking, which may extend to the cortex and outer storage parenchyma; *Bact. solanacearum* causes a brown to black discoloration of the tissues without cracking. The brown rot bacteria are viscous and are exuded from the stolon end and eyes, where they may mingle with dirt and dry on to the tuber surface; those of *Bact. sepedonicum* are not sticky and do not ooze from the tuber. The marked, ring-like appearance of the brown rot symptoms, which tend to be confined to the vascular area and immediately adjacent tissues, is less striking in ring rot, the areas affected by which are soft, pliable, grey, cream, yellow, or reddish-brown in contrast to the shiny consistency and brown to black tinge of brown rot decay.

When tubers affected by ring rot were held for five months at

different temperatures, infection developed rapidly at 70° to 75° F. (50·6 per cent.), less rapidly at 60° to 65° (41·3), and slowly at 37° (11·5).

Most of the potato samples from infected seed stocks obtained from Maine and grown at Hastings, Florida, showed an increase in the percentage of bacterial ring rot compared with that reported for the same stocks in their place of origin. Infection was found to be spread by means of the workers' hands and cutting knives, but not through the soil. Losses from the disease at Hastings in the Spaulding Rose and Katahdin varieties decreased from 5 per cent. in 1937 to 0·5 per cent. in 1939 as a result of the use of certified seed.

BELL (A. F.). **Report of the Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd, 1938–39*, pp. 45–59, 1939.

In this report [cf. *R.A.M.*, xviii, p. 274] it is stated that under the provisions of the Queensland Amended Sugar Experiment Stations Act, which received assent on 27th October, 1938, sugar-cane is excluded from the scope of the Diseases in Plants Act [ibid., ix, p. 607]. All powers for disease control in respect of sugar-cane are vested in the Director of Sugar Experiment Stations, who must issue annually a list of sugar-cane varieties approved for planting in each mill area, such approval remaining valid for three years after the year of planting. The cultivation or possession of any variety not approved may involve a substantial penalty. Provision is made for the production, introduction, and cultivation of experimental varieties under the authority of the Director. Queensland is divided into ten quarantine districts, and the removal of sugar-cane from any one such district to another without special permission is forbidden. Full provision is made for the inspection of fields and properties and for the treatment or destruction of diseased cane. Any area may be declared diseased, and control Boards, financed by compulsory levy and responsible for implementing control measures, constituted therein. [In *Qd agric. J.*, lii, 3, p. 350, a list is given of six districts in Queensland which have been declared infested areas, and in which disease control Boards are to be set up. The diseases concerned are downy mildew (*Sclerospora sacchari*), Fiji disease, and gumming (*B*[*acterium*] *vasculorum*)].

With the increased use of resistant varieties, gumming disease [*R.A.M.*, xix, p. 116] is now negligible in Southern Queensland, while with the elimination of S.J. 4 and H.Q. 426, as well as some nondescript, highly susceptible varieties, it has also decreased in the Mulgrave area. In a trial in the last-named district, S.J. 4, H.Q. 426, Q. 19, and Q. 26 were inferior, Q. 22, Q. 10, Q. 16, and Q. 27 equal or slightly superior to, and Q. 13 and Q. 29 markedly superior to, D. 1135 in resistance, this cane being accepted locally as the standard of minimum resistance. In a trial progressing in Brisbane, S.J. 4, Q. 19, and H.Q. 426 are less resistant than D. 1135 and 1900 seedlings, while Q. 10, Q. 13, Q. 20, Q. 21, and 31–1389 show a higher resistance that approximates to that of Q. 813.

As a result of eradication, inspection, and roguing work the Fiji disease situation in the Bundaberg area [loc. cit.] has improved. Progress inspections failed to reveal infection in Jason, Co. 290, C.P. 29/116, P.O.J. 213, Q. 813, and *Erianthus*; Q. 23 showed resistance, and Q. 25

fell into the same class as D. 1135, Comus, and P.O.J. 2878. Co. 419, a cross between P.O.J. 2878 and Co. 290, showed high susceptibility.

When water at 52° C. was passed continuously for 20 minutes over single buds, alternate buds being left untreated as controls, and all being then planted, a total of 18 control buds gave nine stools definitely affected with chlorotic streak [ibid., xviii, p. 274], as against only three for the same number of treated buds. In a chlorotic streak varietal resistance trial the percentage ratios of diseased to healthy stools for the varieties 'X' 1, 'X' 14 (both Black Cheribon×*S[accharum] robustum*), P.O.J. 213, Co. 290, Vulcan, Uba, P.O.J. 234, and Q. 4 were, respectively, 4, 3, 3, 3, 1, 0, 0, and 0 per cent. compared with 97 per cent. for S.J. 4; in a second trial on another farm the corresponding figures for 'X' 1, 'X' 14, P.O.J. 213, Co. 290, Uba, P.O.J. 234, and S.J. 4 were 4, 1, 2, 1, 4, 3, and 68 per cent., the figures for Co. 290 and P.O.J. 234 each including a doubtful case.

In a varietal resistance trial against leaf scald (*Bact. albilineans*) [loc. cit.] the varieties Co. 270, Co. 421, 24 R 1057, 25 R 96, 25 R 408, 25 R 491, 30 MQ 2124, Vulcan, Q. 2, Q. 10, Q. 1098, and P.O.J. 2878 gave no diseased stool from any inoculated sett compared with more than 75 per cent. diseased stools for 30 R 61.

The chief sugar-cane problem in Queensland is downy mildew (*Sclerospora sacchari*) [ibid., xviii, p. 549]. As the disease has been present for many years in nearly every cane-growing area, and the Kassoer and Chunnee breeding lines are highly susceptible to it, it is also a limiting factor in the control of other diseases. In resistance trials at Bundaberg and Mackay no infection was shown by Q. 25, C.P. 29/116 (E. 12), and Comus (F. 40) and over 75 per cent. infection by P.O.J. 213, 2940, and 2878, Q. 24, and Co. 419. In an alternate host trial the maize varieties, Imperial Yellow Dent, Funk's 90-Day, and Reid's Yellow Dent planted among diseased P.O.J. 2878 and 213 canes rapidly became heavily infected, producing abundant spores from both leaf surfaces. Sugar-cane was then reinfected by placing freshly cut setts of P.O.J. 213 under the leaves of the diseased maize. It is evident that in the presence of downy mildew the planting of maize near sugar-cane should cease. The maximum and minimum temperatures for the sporulation of *S. sacchari* were, respectively, about 31° and 16°; abundant sporulation, with no defined optimum, occurred between 21° and 28·5°. Spore production occurred in darkness, but appeared to require some exposure to sunlight each day.

MUNDKUR (B.B.). **Taxonomy of the Sugar-Cane smuts.**—*Kew Bull., 1939*, 10, pp. 525–533, [issued 1940].

After briefly discussing the confusion existing in the nomenclature of the smuts attacking species of *Saccharum* and *Erianthus*, the author states that in view of the opinion expressed by Sydow [*R.A.M.*, iv, p. 127] that there may be, in addition to *Ustilago scitaminea* and *U. consimilis*, a third culmicolous smut attacking *Saccharum*, distinguishable by spore size, he made a critical examination of available collections of sugar-cane smuts. These included collections from India (52), the Philippines (11), China (3), Java (3), Natal (2), Burma (1), and Mauritius (1). As a result, it was ascertained that the smuts were

divisible into two species and two varieties, of which the latter are regarded as new. The first of these new varieties, *U. scitaminea* var. *sacchari-barberi* n. var., was mentioned (but not described) by Sydow in 1924 as intermediate between *U. consimilis* and *U. scitaminea* [loc. cit.]; it attacks *S. spontaneum*, *S. barberi* (the type host), and *S. officinarum*, and appears to be moderately common in northern and eastern India and was also found in material from Mauritius. It is described as differing from the type species in its 'mummy-brown' spores, which measure 5·1 to 8·6 (average, 6·7) μ in diameter, and have a thick, very minutely verrucose epispore with a rough margin. The second new variety, *U. scitaminea* Syd. var. *sacchari-officinarum* n. var., occurs on *S. officinarum* and *S. spontaneum* and differs from the type species in its 'Vandyke brown' spores, which measure 6·5 to 11·3 (average 8·4) μ in diameter, and have a moderately thick, coarsely echinulate epispore. The type is U.S.D.A. Mycological and Pathological Collections, No. 60442, collected by Reinking in 1917 at Los Baños and issued as *U. sacchari* Rabenh. Emended descriptions of *U. consimilis* and *U. scitaminea* are given, together with a key to the species and varieties.

Imazeki (R.). **Observations on Japanese fungi (III). Some hard and perennial Stereums in Japan.**—*J. Jap. Bot.*, xv, 9, pp. 578–588, 20 figs., 1939. [Japanese, with English summary.]

A key is provided to the nine species of *Stereum* of the coriaceous-woody type (including a new one, *S. hiugense* [with a Latin diagnosis], the cause of a white rot of oak), investigated by the author on hardwoods and conifers in Japan and described in the present paper.

Mycological Society of America. Fungi collected at the foray, August 1938.—*Mycologia*, xxxi, 6, pp. 728–736, 1939.

A list is given of 836 species and varieties of fungi collected by members of the Mycological Society of America during the foray held at Duchesnay, Quebec, 23rd to 27th August, 1938.

Tehon (L. R.). **New species and taxonomic changes in the Hypodermataceae.**—*Mycologia*, xxxi, 6, pp. 674–692, 6 figs., 1939.

Descriptive notes [with Latin diagnoses] are given on nine new species belonging to the Hypodermataceae, as well as on seven established species, two of which are transferred from *Lophodermium* to *Clithris*. *Lophodermina rhododendri* having been found in 1931 on the stems of *Rhododendron californicum*, its habitat is extended to include attack on stems. The fungus appears to cause a die-back of infected twigs. In the material from the stems of *R. californicum* the ascospores differ from those hitherto found on leaves in that they taper basally to needle-like points, in this respect resembling very long-spored species of *Hypodermella*.

Overholts (L. O.). **Geographical distribution of some American Polyporaceae.**—*Mycologia*, xxxi, 6, pp. 629–652, 30 maps, 1939.

In this Presidential address to the Mycological Society of America the author discusses the geographical distribution of the Polyporaceae

of the United States and Canada and the factors determining this distribution. By comparing maps showing the known occurrence of various pileate species with others illustrating the range of the principal hosts he attempts to fill in the gaps in present-day knowledge of the distribution of these fungi and to suggest likely extensions in geographical range.

Overholts (L. O.). **The genus Stereum in Pennsylvania.** – *Bull. Torrey bot. Cl.*, lxvi, 8, pp. 515–537, 5 pl., 1939.

In this monograph 27 species of *Stereum* [cf. preceding page] are described and a key is given to facilitate identification. *S. purpureum* [*R.A.M.*, xv, p. 103] is found on the dead wood of various deciduous trees and perhaps occasionally on conifers. It is fairly widespread in Pennsylvania and specimens have also been received from ten other States of the Union, as well as from Canada (Ontario). *S. rugosiusculum*, on the same hosts as the foregoing, is maintained as a distinct species, differing chiefly from *S. purpureum* in the presence of cylindrical, hyaline cystidia, 4 to 6 μ in diameter [ibid., iii, p. 343]. This species is widely distributed in the United States and has also been reported from British Columbia.

Guyot (A. L.). **Les Urédinées (ou rouilles des végétaux). I. Uromyces. [The Uredineae (or plant rusts). I. Uromyces.]** –(*Encycl. mycol.*, Vol. VIII), 439 pp., 62 figs., 26 maps, Paris, Paul Lechevalier, 1938. [Received January, 1940.]

This first part of this valuable monograph deals with species of *Uromyces* found on Gramineae, Cyperaceae, Juncaceae, Ranunculaceae, Polygonaceae, Umbelliferae, and Campanulaceae in Europe, Western Asia, and North Africa, and notes are also appended on records from other localities. Following a general discussion of the genus the author divides it into the following morphologic types based on teleutospore characters, viz., *papillati*, *coronati*, *crassi*, *tenues*, *angulati*, and *verrucosi*. Each species is described with its synonymy, exsiccata from the area covered, figures, hosts, geographical distribution, and notes on biology. The bibliography comprises 752 titles.

[Corrections and additions to this work appear in *Uredineana*, i, pp. 161–177, Paris, Paul Lechevalier, 1939, the two volumes being sold together, price 300 Fr.]

Long (W. H.) & Goodding (L. N.). **Two new species of rust.** *Mycologia*, xxxi, 6, pp. 670–673, 1 fig., 1939.

Of the new rusts from Arizona described in this paper, *Gymnosporangium vauqueliniae* n. sp. was found on Rosaceae, the pycnidia and aecidia being typically present on *Vauquelinia californica* and the teleutospores on *Juniperus monosperma*.

Mains (E. B.). **New and unusual species of Uredinales.**— *Bull. Torrey bot. Cl.*, lxvi, 9, pp. 617–621, 1939.

Among the new or otherwise interesting rusts (ten in all) described with critical annotations in this paper may be mentioned *Frommea mexicana* n. sp. [with a Latin diagnosis] on *Fragaria mexicana* in

Mexico, characterized by sparse, pulverulent, pale yellow uredosori, ellipsoid or obovoid, hyaline, echinulate uredospores, 16 to 20 by 13 to 16 μ, sparse, cinnamon-brown teleutosori, and cylindrical to clavate, bi- or triseptate teleutospores, 38 to 60 by 23 to 32 μ, with hyaline pedicels up to 50 μ in length. With the doubtful exception of *Phragmidium fragariastri*, this appears to be the first record of a rust on a strawberry.

Hiratsuka (N.). **Miscellaneous notes on the East Asiatic Uredinales with special reference to the Japanese species (VI).**—*J. Jap. Bot.*, xv, 10, pp. 621–627, 2 figs., 1939.

This further instalment of the author's critically annotated list of eastern Asiatic (chiefly Japanese) Uredinales [*R.A.M.*, xix, p. 45] comprises 21 species, including *Melampsora larici-epitea* on willow (*Salix viminalis*) [ibid., xv, p. 175], *M. larici-populina* on poplar (*Populus nigra* var. *italica*), both new to Korea, *Puccinia fagopyri* on buckwheat [ibid., xii, p. 248], and *M. medusae* [ibid., vii, p. 61] on *Populus maximowiczii*, both recorded for the first time in Japan; the last-named differs from *M. larici-populina* in its smaller uredo- and shorter teleutospores.

Hirschhorn (Elisa). **Las especies de 'Cintractia' de la flora Argentina.** [The species of *Cintractia* of the Argentine flora.]—*Rev. argent. Agron.*, vi, 3, pp. 179–202, 4 pl., 2 figs., 1939.

On the basis of an examination of specimens in the Spegazzini herbarium and other material the author describes ten species and varieties of *Cintractia* for the Argentine. The list includes one new variety and two new combinations, the kernel smut of sorghum, *Sphacelotheca sorghi*, being transferred to *Cintractia*.

Drechsler (C.). **Three species of Pythium with large oogonial protuberances.**—*Phytopathology*, xxix, 12, pp. 1005–1031, 10 figs., 1939.

Amplified diagnoses are given of *Pythium mastophorum* and *P. polymastum*, originally isolated from *Bellis perennis* and lettuce, respectively, in the United States [*R.A.M.*, x, p. 211]. The two species are considered to be closely related, the oogonial and oospore diameters on maize meal cultures of the former ranging from 25 to 41 and 21 to 35 μ, respectively, and those of the latter from 26 to 59 and 21 to 46 μ, respectively. Another species apparently falling into the same group is *P. megalacanthum*, associated with flax scorch and the decay of various ornamentals in Holland [ibid., xviii, pp. 154, 268], though the affinities of this organism are considered to present a very complex problem, the final solution of which may involve its transference to the section of the genus comprising such spiny, proliferous forms as *P. anandrum* [ibid., xviii, p. 651], while a relationship with *Phytophthora stellata*, described by L. Shanor [as occurring on Rhododendron petals in cold spring water in North Carolina] (*J. Elisha Mitchell sci. Soc.*, liv, pp. 154–162, 1938), is also indicated. The oogonial and oospore diameters of a Baarn culture of *Pythium megalacanthum* ranged from 25 to 82 μ and 20 to 66 μ, respectively, values which conflict materially with those furnished by de Bary, viz., 36 to 45 and 27 μ, respectively

(*Bot. Ztg*, xxxix, 1881). From these and other discrepancies the author concludes that there is not sufficient evidence to identify the fungus described as *P. megalacanthum* in recent reports with that originally isolated by de Bary.

NEILL (J. C.). **The mould fungi of New Zealand. II. The genus Aspergillus.**—*Trans. roy. Soc. N.Z.*, lxix, 2, pp. 237–264, 1939.

Continuing his studies on New Zealand moulds [cf. *R.A.M.*, xvi, p. 775], the author describes 18 species of *Aspergillus* encountered during the past four years in the course of industrial and soil-mycological investigations. Particulars are also given of a further 17 species of dubious authenticity, not yet recorded in New Zealand, together with lists of rejected species. He relegates to synonymy all of the other 66 specific names accepted by Thom and Church.

KASSANIS (B.). **Intranuclear inclusions in virus infected plants.**—*Ann. appl. Biol.*, xxvi, 4, pp. 705–709, 1 pl., 1939.

Crystalline plate-like inclusions were found to occur in the nuclei of Solanaceous plants infected with the severe etch virus of tobacco [*R.A.M.*, xvii, p. 352]. These inclusions were invariably found in both young and old plants of all susceptible species and in every tissue of the infected plant except at the growing points of the roots and stems. They were much more common than the amorphous cytoplasmic inclusions, similar to X-bodies, which were also present. Most nuclei contained more than one and up to 15 crystalline inclusions. These are thin, rectangular plates of variable size, the lengths of their sides measuring from 3 to 10 μ. Between crossed Nicol prisms they show no extinctions either because they are optically isotropic or too small to give a visible effect. They usually appear from 12 to 16 days after infection or a week after external symptoms become manifest, and persist for several months. They are more stable than either the cytoplasmic inclusions or the crystalline inclusions of tobacco mosaic virus, respond readily to acid dyes but not to Feulgen's reagent, stain brown with osmic acid, and yellowish-brown with iodine, and are unaffected by the usual methods of decalcification of fixed tissues. They are stated to resemble in many ways the intranuclear inclusions described in the polyhedral disease of silkworms.

THUNG (T. H.). **Smetstof en plantencel bij enkele virusziekten van de Tabaksplant V.** [Infective principle and plant cell in some virus diseases of the Tobacco plant V.]—*Tijdschr. PlZiekt.*, xlv, 6, pp. 247–259, 1939. [English summary.]

Continuing his studies at the Vorstenland Experiment Station, Java, on the protective action of certain tobacco viruses against others [*R.A.M.*, xviii, p. 207], the writer found that the simultaneous inoculation of Kanari-Vorstenland tobacco plants with the Rotterdam B virus and, on the same or different leaves, that of one of the other sap-inoculable diseases, viz., ordinary, severe, white, mild, or Holmes's distorting mosaic, causes a retardation in the development of Rotterdam B symptoms but not of those of the other disorders. The delay was longest in the case of white mosaic and shortest in that of distorting.

No retardation in the development of white mosaic symptoms occurred as a result of inoculation with Rotterdam B virus and subsequently (within six days) with white mosaic; after longer intervals, however, delay does take place, its length being proportionate to the period elapsing between the inoculations.

The premature flowering of tobacco plants mildly infected by Rotterdam B disease, and showing a slight excess of starch in the foliage, is tentatively attributed to the destruction by the virus of the transport channels for carbohydrates as well as for the various mosaic viruses. However, if one or other of the latter has first invaded these channels, the access of the Rotterdam B virus to the growing points of the plants is prevented or retarded. This theory involves the assumption, also accepted by C. W. Bennett in the case of beet curly top [ibid., xvi, p. 650], that the same transport channels serve both for viruses and assimilation products. The virus particles are reproduced within the cells constituting the transport channels.

The mutually antagonistic effects of the viruses under discussion are presented in tabular form, showing at a glance which particular virus can immunize a tobacco plant against infection by others of the same group. The dominating influence of white, distorting, mild, and ordinary mosaic over other diseases varies but slightly: white mosaic is less powerful when inoculated simultaneously with the ordinary mosaic virus, but if inoculated first is capable of immunizing its host against the last-named. The symptoms of the viruses transmissible by *Myzus persicae* (speckled mosaic and streak) are not in reality suppressed by the others, although they may be masked; they are capable of reproducing themselves in plants affected by the sap-inoculable diseases. The immunization of tobacco plants against insect-transmissible viruses by inoculation with those of the sap-inoculable group is therefore impracticable.

Boyd (C. C.). **Downy mildew injury of Tobacco in the field and after harvest in Massachusetts.**—*Plant Dis. Reptr*, xxiii, 23, pp. 381–382, 1939. [Mimeographed.]

Observations on the course of downy mildew (*Peronospora tabacina*) on shade tobacco [*R.A.M.*, xviii, p. 482] in Massachusetts in 1937 led to the following recommendations for the exclusion of the disease from the field: continuation of the seed-bed treatments throughout the re-stocking season and prompt destruction of the beds on the completion of re-stocking. The same precautions should be adopted by owners of Havana seed-beds, which may otherwise contract the disease during or after re-stocking and thus serve as a dangerous source of infection for neighbouring or even more distant shaded fields.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 12, pp. 667–669, 3 figs., 1939.

The methods recommended for the control of tomato leaf spot (*Septoria lycopersici*) [*R.A.M.*, xviii, pp. 353, 421] in New South Wales consist of the use of clean seed-boxes and soil for the growth of seedlings, crop rotation, spraying the seed-beds with Bordeaux mixture (1–1–20), and plants well established in the field with the same at 1–1–10, in both cases at fortnightly intervals, and the removal and destruction of

crop debris. Old seed-boxes may be cleaned with formalin solution (1 in 50), and the soil can be sterilized by drenching with formalin.

Celery black heart [ibid., xvii, p. 647] has been observed in several places in New South Wales. In the Windsor area it has caused very serious losses in irrigated crops.

Curtis (K[athleen] M.). **Control of Tomato leaf-mould : the value of different sprays.**—*N.Z.J. Sci. Tech.*, xxi, A, 3, pp. 187–192, 3 figs., 1939.

In spraying experiments in 1938–9 at the Cawthron Institute, Nelson, New Zealand, in the control of leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xvii, p. 79], the best results as regards elimination of the fungus were secured by weekly applications (starting one week after planting out) of copper emulsion (4 lb. copper sulphate and 20 lb. potash soft soap per 100 gals.) and red copper oxide (1 lb. plus 1 gal. cottonseed oil and 2 lb. lethalate [ibid., xvii, p. 685]), followed by shirlan WS [ibid., xviii, p. 461] (3lb. on 3rd, 10th, and 17th October, 1½lb. thereafter), shirlan AG (3 lb.), and bouisol (2 lb. plus 5 lb. potash soft soap). The following yields per plant were obtained: untreated 6·3 lb., shirlan WS 9, shirlan AG 8·8, copper emulsion 7·1, red copper oxide 8·2, and bouisol 7·1. From the commercial standpoint the two shirlans proved the most satisfactory of the fungicides tested, though a tendency on the part of WS to cause leaf scorch when applied under power precludes its recommendation for this purpose at present.

Wolf (F. A.). **Fungi of the Duke Forest and their relation to forest pathology.**—*Bull. Sch. For. Duke Univ.* 2, 122 pp., 53 figs., 1938. $1.00. [Received February, 1940.]

This bulletin, in the compilation of which the author was assisted by K. H. Garren and J. K. Miller, records the fungi collected over a period of six years in the Duke Forest, North Carolina, with the object of providing a basis for future research in forest pathology. A general outline and discussion of the larger fungus groups encountered in the area under observation is followed by a more detailed consideration of the principal agents of tree diseases and decays in the forest, arranged topically under the affected hosts. Fungus and host indexes are appended.

Lorenz (R. C.) & Davidson (R. W.). **Observations on several diseases of hardwoods in the Lake States.**—*Plant Dis. Reptr*, xxiii, 23, pp. 384–385, 1939. [Mimeographed.]

In March, 1939, a box elder (*Acer negundo*) of intermediate crown classification on the Little Fork River east of Grand Falls, Minnesota, was observed to bear a canker similar to that prevalent on maples (*A.* spp.). The heavy, buff-coloured mycelial fans typical of *Eutypella parasitica* [*R.A.M.*, xviii, p. 147] were found under the bark, in the central area of which abundant perithecia were also present. An American elm (*Ulmus americana*) in the same locality and another in northern Minnesota (both suppressed) were attacked by *Schizoxylon microsporum* [loc. cit.], the apothecial and pycnidial stages both fruiting on the marginal area of the canker on the first-named tree. In

1936 butt and trunk rot of living black ash (*Fraxinus nigra*) caused by *Fomes conchatus* [ibid., xiv, p. 193] was observed in northern Wisconsin and Lower Michigan, and subsequently the fungus has also been collected on the same host in northern Minnesota.

Campbell (W. A.). **Daedalea unicolor decay and associated cankers of Maples and other hardwoods.**—*J. For.*, xxxvii, 12, pp. 974–976, 1 fig., 1939.

In the course of a butt rot study in the Green Mountain National Forest, Vermont, *Daedalea unicolor* [*R.A.M.*, xviii, p. 335] was found producing extensive yellow, later dull white cankers, sometimes girdling the trunk, on living sugar and red maples (*Acer saccharum* and *A. rubrum*), paper and yellow birch (*Betula papyrifera* and *B. lutea*), and once on elm (*Ulmus americana*). On one area about 13 per cent. of the dissected sugar maple sprouts were rotted by *D. unicolor*, which is very destructive, trees with five- to seven-year-old infections being sufficiently weakened to be thrown by wind. Entry is commonly effected through dead or cut companion sprouts. The fungus is able to attack the heartwood, and in this respect appears to act as a parasite.

Long (W. H.). **Two pocket rots of hardwood trees.**—*Bull. Torrey bot. Cl.*, lxvi, 9, pp. 625–627, 4 figs., 1939.

In the course of field investigations in Florida from 1913 to 1918, the writer detected the hymenophores of *Fomes extensus* in association with a basal white pocket heart rot of living *Exothea paniculata*, *Lysiloma bahamensis*, and *Taxodium distichum*, the decayed area uniformly extending downwards into the roots and upwards into the butts for a distance of 2 to 3 ft. In *E. paniculata* the white, lens-shaped pockets, 5 to 20 by 2 to 10 mm. long in radial section, are filled with cellulose, which is slowly absorbed by the fungus, leaving small cavities lined with fibre remnants. The pockets expand faster longitudinally than radially, with the result that the cross walls are gradually destroyed and the rotting wood separates into thin, longitudinal, irregular sheets with a central layer of dark brown, semi-decayed wood. In the final stages of the rot, much of the invaded heartwood is disorganized, leaving large, partially empty pockets lined with fibres and sometimes occupied by a central mass of light, flocculent mycelium. In *L. bahamensis* the rot caused by *F. extensus* is similar to the foregoing, but in *T. distichum* the pockets are much larger (4 to 8 by 1 to 2 cm.) and empty except for a thin, whitish, arachnoid mycelial membrane on the walls.

During the same period investigations in the Mississippi River Valley disclosed the hymenophores of *Polyporus rigidus* on logs and stumps of *Liquidambar styraciflua* showing a characteristic honeycomb rot. Dead, fallen trees of *Nyssa sylvatica*, plane (*Platanus occidentalis*), and oak (*Quercus alba*) were similarly but less conspicuously attacked. The rot pockets in *L. styraciflua* are lenticular, 1 to 2 by 0·5 to 1 cm. in radial-longitudinal section, and filled with a white, arachnoid mycelium in the final stages, when the infected wood is very light. The same fungus was collected in Arkansas, Mississippi, Tennessee, Texas, and Virginia. According to L. O. Overholts, *Polyporus rigidus* is responsible for a well-marked pocket rot in the south very like that caused by *P.*

zonalis [*R.A.M.*, xvii, p. 88], the two species being closely related, with the same minute, thick-walled tubes, and similar spores, hyphae, and basidia. *P. rigidus* is usually resupinate, in which stage it has been identified by some authorities as *Poria undata*, but occasionally develops a very narrow, reflexed pileus.

Herrick (J. A.). **A microscopical study of the mycelium of Stereum gausapatum Fries.**—*Trans. Amer. micr. Soc.*, lviii, 4, pp. 377–384, 2 pl., 1939.

A microscopic study was made at the Kent State University, Ohio, of 36 monosporous isolates and 21 others on potato dextrose agar of *Stereum gausapatum*, the agent of heavy damage to North American and European oak forests [*R.A.M.*, xix, p. 125 and next abstract]. The advancing mycelium consists of hyphae 1 to 10 μ in diameter, the larger ones furnished with typically non-septate clamp-connexions, often occurring in whorls, while the 'giants' of maximum dimensions, characteristic of fast growing strains, bear multiple clamps (up to six). The submerged hyphae are more irregular than the aerial and free from conspicuous enlargements. Clamp-connexions are almost entirely absent from the densely tangled mass constituting the superficial cottony mat. All the hyphae are thin-walled and circinate individuals are frequently encountered. Vegetative anastomoses were common in all the cultures under observation, but no spores were detected in any. The yellowish colour proper to many old mycelia was found to be due to an oily pigment. It is tentatively concluded that *S. gausapatum* is homothallic.

Roth (E. R.) & Sleeth (B.). **Butt rot in unburned sprout Oak stands.**—*Tech. Bull. U.S. Dep. Agric.* 684, 42 pp., 11 pl., 5 graphs, 1 map, 1939.

A study of butt rot in unburned oak stands carried out from 1933 to 1936 in the Alleghany, Appalachian, and central regions of the United States showed that for 45 clear-cut plots the average age per plot ranged from 17 to 84 years, and the number of decay cases from 0 to 64 per cent., the average height of decay being 7 to 74 in. The common source of entrance for decay fungi was the parent stump, through which heart-rot fungi entered in 86 per cent. of the cases. Decay incidence was correlated with diameter of parent stump, sprouts from large stumps being more subject to butt rot than sprouts from small ones. Sprouts arising from beneath the ground had the lowest possibility of becoming infected with heart-rot fungi from the parent stump. The presence of stump wounds was correlated with that of butt rot. The time of heartwood formation and subsequent connexion with the parent stump determined the time of earliest infection from the parent stump.

Chestnut oak (*Quercus montana*), white oak (*Q. alba*), red oak (*Q. borealis* var. *maxima*), scarlet oak (*Q. coccinea*), and black oak (*Q. velutina*) showed, respectively, 11, 19, 22, 28, and 39 per cent. decayed sprouts. In 744 sprouts affected with butt rot the linear extent of evident decay averaged slightly over 3 ft. above the ground. *Stereum gausapatum* [see preceding abstract] was responsible for 62 per cent. of all the cases of butt rot for which decay fungi were determined, and *Fistulina hepatica* [*R.A.M.*, xviii, p. 72] and *Armillaria mellea* [ibid.,

xvii, p. 714] for 10 per cent. each. Sixteen species of fungi accounted for the remaining 18 per cent. of butt rot. The 19 species isolated [which are listed] included ten genera; there were nine species of *Polyporus* (including *P. sulphureus* and *P. zonalis*) [see above, p. 245], two of *Stereum*, one of *Poria* (*P. cocos*) [ibid., xiii, p. 657], and one of each of the remainder. As a rule only one fungus was responsible for the major decay in any individual tree. In only 5 out of 508 cases were two or more species isolated from the same sprout, and no two fungi had entered at the same point. In one 95-year-old white oak sprout *S. frustulosum* [ibid., xviii, p. 361] was isolated at a height of 102 in., *Corticium lividum* [ibid., xvi, p. 505] at 200 in., *Polyporus sulphureus* at 276 in., and *S. gausapatum* at 320 in. In a 52-year-old scarlet oak sprout, *S. gausapatum* extended from ground-level to 132 in., *Hydnum erinaceus* [ibid., xvi, p. 716] was isolated at 168 in., and *C. lividum* was found at 180 in. These observations indicated that as a tree ages the possibility of infection by more than one fungus increases.

No relationship was found between hosts and the fungi causing butt rot. *F. hepatica* was isolated from scarlet oak in 42 cases out of 50 from this host, but this preference may have been due to local conditions rather than specialization. The average rate of decay for *S. gausapatum* in the different oak species ranged from 2 in. (white and chestnut oaks) to 3 in. (red oak) per annum. The maximum rate of spread by this fungus was almost twice as rapid in the black oak as in the white oak group.

The paper concludes with suggestions for keeping decay losses at a minimum in sprout oak stands by means of appropriate cultural treatments applicable to very young stands, established stands not over 20 years old, and stands of any age. In the last-named group the longer the rotation the greater need of keeping decay at a minimum. Trees repeatedly cut over are usually highly defective and should be avoided for long rotations. Butt rot is prevalent on trees badly wounded by fire and precautions against decay in these trees are less likely to succeed than on unscarred trees.

Hirt (R. R.). **The development of blister rust on young planted northern White Pine.**—*J. For.*, xxxvii, 12, pp. 967–969, 1 graph, 1939.

The progress of blister rust (*Cronartium ribicola*) [*R.A.M.*, xix, p. 176] in six plantations or northern white pine (*Pinus strobus*) in the Charles Lathrop Pack Demonstration Forest, Warrensburg, New York, during the first five years after their establishment from 1928 to 1933 is reported [ibid., xvi, p. 7]. A single exposure of the young trees to teleutospore-bearing black currant (*Ribes nigrum*) bushes for 12 to 24 hours under natural meteorological conditions resulted in a maximum of 4 per cent. infection, whereas continuous exposure throughout a summer caused up to 69 per cent. Within five years of infection, about one-third of the diseased trees died, but some persisted for up to 11 years. Eventually a plantation will free itself from blister rust through the death of infected trees if sufficiently well protected from subsequent attacks. Under the experimental conditions about one-third of the infected trees survived, mainly because the diseased branches died before the rust became established in the stems. Aecidiospores were

produced on so few blister rust cankers on the young trees that they did not constitute an important factor in local dissemination. The standard control practice of eradicating the alternate host within 900 ft. of the plantation borders afforded efficient protection, permitting only 0·5 per cent. infection within five-year periods.

HIRT (R. R.). **Canker development by Cronartium ribicola on young Pinus strobus.**—*Phytopathology*, xxix, 12, pp. 1067–1076, 1 fig., 1 graph, 1939.

The author fully describes the results of observations on the development of some 1,000 blister rust (*Cronartium ribicola*) cankers on over 16,000 three- to four-year-old northern white pines (*Pinus strobus*) exposed to natural infection from the teleutospores on neighbouring black currants for periods of 12 to 24 hours in two localities of New York State from 1928 to 1933 and from 1935 to 1936 [see preceding abstract].

The fungus becomes established on white pine through the needles and to some extent the time required for it to appear in the bark seems to depend on the distance of the needle spot (the discoloured spot at the site of entry on a needle) from the cortical tissue. Needle spots as far as 4·5 cm. from the bark can give rise to cankers 0·1 cm. in diameter within 12 to 15 months after initial infection, thus permitting the rust to reach the cortex even in dry seasons when the young trees retain their needles for only two summers. Normally the needles of transplants and young plantation stock are retained for two to three years or more, during which period the fungus is able to reach the bark from spots situated at distances of upwards of 4·5 cm. in both current-season and one-year-old needles. About half of all the cankers formed were perceptible by the autumn of the season following that of inoculation, and 94 per cent. by the succeeding spring. The rate of extension of the rust down the branches towards the stem increased with the age of the cankers during the third year, ranging from 0·7 to 5 cm. On 36 trees the average time taken by branch cankers to reach the stem was three years, after which the pines mostly succumbed within 3½ years, though some cases of survival for 6½ were noticed. Aecidiospores were produced in a few of the branch cankers, but commonly their formation was delayed until the cankers had been established for a year or more in the stems.

MCCORMICK (FLORENCE A.). **Phaeocryptopus gäumanni on Douglas Fir in Connecticut.**—*Plant Dis. Reptr*, xxiii, 22, pp. 368–369, 1939. [Mimeographed.]

In January, 1938, Douglas fir [*Pseudotsuga taxifolia*] at East Willington, Connecticut, was found to be infected by *Phaeocryptopus gaeumanni* [*R.A.M.*, xix, p. 177], though later the fungus was accidentally discovered on a collection of Douglas fir needles from Salisbury, Connecticut, labelled 'undetermined' and dated 1929. In November, 1939, the author visited Salisbury, and found that the trees from which the needles had been taken were badly diseased or almost dead. Apparently, the fungus acts very slowly in killing infected trees, but produces a yellowish colour and causes heavy defoliation, the trees lingering on in

this condition for years. The fungus has also been found at Taconic, Lakeville, and Sharon, and would appear to be widespread in the north of Connecticut, though not yet found in the south.

Ellis (D. E.). **Conifer diseases hitherto unreported from the southwest.**—*Plant Dis. Reptr*, xxiii, 21, p. 341, 1939. [Mimeographed.]

The following conifer diseases are believed to be here reported for the first time from the forests of the south-western States: needle blight of Douglas fir (*Pseudotsuga taxifolia*) in Arizona caused by *Rhabdocline pseudotsugae* [*R.A.M.*, xix, p. 178], associated in the early stages with an imperfect fungus resembling *Rhabdogloeum pseudotsugae*; *Elytroderma deformans* on *Pinus edulis* and *P. ponderosa* [ibid., xii, p. 254], also in Arizona, frequently producing witches' brooms on both hosts; and a canker of *P. ponderosa* very similar to that attributed to *Cenangium piniphilum* [ibid., xv, p. 117], to which the causal agent also appears to be closely related, in Arizona and New Mexico, responsible for widespread malformations involving up to 60 per cent. of the reproduction in localized areas near Ruidoso in the latter State but otherwise of slight importance.

Sandu-Ville (C.). **Exosporium deflectens Karst. auf Blättern von Juniperus communis L. in Rumänien.** [*Exosporium deflectens* Karst. on leaves of *Juniperus communis* L. in Rumania.]—*Bull. Sect. sci. Acad. roum.*, xxi, 5–6, pp. 113–116, 1939.

The writer collected in 1937 specimens of the fungus described by Georgescu and Badea in *Rev. Pădurilor*, part 3, 1935, as *Cercospora juniperina* (syn. *Camarosporium juniperinum*), the agent of needle fall of juniper (*Juniperus communis*) leaves in the eastern Carpathians, Rumania. A comparative examination of the material led to the conclusion that the fungus is neither a *Camarosporium*, being devoid of true pycnidia, nor a *Cercospora*, in which genus the conidia are produced in groups on each conidiophore and not, as in the present case, singly at the apex. Moreover, the hard, carbonaceous structure embedded in the leaf and protruding on the surface is not a dense network of hyphae, characteristic of *Cercospora*, but a sclerotial nodule or sporodochium invading the parenchyma. The organism is referred to *Exosporium deflectens* Karst., originally observed on the same host in Finland, and is furnished with a revised diagnosis. It is characterized by circular, obovoid or deformed, erumpent, smooth, olivaceous to black sporodochia, 0·2 mm. in diameter; pale yellow, oblong or cylindrical, straight, 1- to 4 (? 7)-septate conidia, 22 to 42 by 5 to 6 μ; and cylindrical, dilute fuliginous basidia, 10 to 15 by 5 to 6 μ.

Siggers (P. V.). **Scirrhia acicola (Dearn.) n. comb., the perfect stage of the fungus causing the brown-spot needle blight of Pines.**—*Phytopathology*, xxix, 12, pp. 1076–1077, 1939.

The genetic connexion between the imperfect stage of the pine needle blight fungus, usually referred to *Septoria acicola* [*R.A.M.*, xvi, p. 218] but probably more correctly designated *Lecanosticta acicola* (Thüm.) Syd., and the ascigerous phase *Oligostoma acicola* [ibid., vi, p. 126] was determined by the study for 6 to 14 months of 18 monoascospore cultures from four needle collections from two of the three known hosts,

Pinus palustris, *P. taeda*, and *P. thunbergii* from the southern States. The conidia formed in each ascospore culture were found to resemble in shape, size, and colour those produced in cultures arising from conidia. The physiological reaction of the ascospores to environmental factors affecting germination and initial hyphal growth approximated to that of conidia taken directly from the host. Moreover, ascogenous locules often develop on the margins of old stromata of the conidial stage of the needle blight.

The inclusion of the fungus under discussion in *Oligostroma* Syd. is regarded as untenable by reason of its compact, non-clypeate, erumpent stroma in contrast to the non-erumpent, clypeate ascocarps of *O. proteae*, the type species. The stroma of the perfect stage of the brown spot needle blight organism conforms to the characters of *Scirrhia* Fckl, to which it is accordingly transferred as *S. acicola* (Dearn.) n. comb., with an emended diagnosis. The maximum size of the 1- to 18-loculate, linear stroma, usually seated in the mesophyll, is 2·5 by 0·3 mm., the conical to globose or variable, uni- to triseriate locules measuring 40 to 80 μ in diameter. The aparaphysate asci, tapering apically, measure 30 to 35 by 6 to 9 μ and are occupied by hyaline, oblong to cuneate spores, uniseptate past the centre, usually containing oil globules, 9 to 16 by 3 to 4 μ. The ascospores would appear to be disseminated by wind, and are probably responsible for infection found at appreciable heights from the ground on saplings and older trees, the conidia being adapted for dispersal solely by rain splash. Evidence was also forthcoming that the perfect stage of the fungus develops only on needles that are mostly dead, the ascospores being mainly produced during the winter and spring.

Baechler (R. H.). **Experiments on toxicity, leaching, and fire-retarding effectiveness of Wolman salts.**—[*Publ.*] *For. Prod. Lab., For. Serv., U.S. Dep. Agric.*, 10 pp., 1 diag., 3 graphs, 1938. [Mimeographed. Received February, 1940.]

A tabulated account is given of experiments at the Forest Products Laboratory, Madison, Wisconsin, to determine the toxicity of the Wolman salts [*R.A.M.*, xix, p. 180], triolith-U [ibid., xv, p. 186] and t[h]analith-U [ibid., xv, pp. 333, 547], to malt agar cultures of the wood-destroying fungi, *Coniophora cerebella* [*C. puteana*], *Lentinus lepideus*, *Lenzites trabea*, Madison No. 517 [ibid., xvii, p. 5], *Poria incrassata*, and *Polyporus vaporarius* [*Poria vaporaria*], and the resistance of these compounds to lixiviation on small southern yellow pine [? *Pinus ponderosa*] sapwood blocks with a moisture content of 14 to 15 per cent. The killing concentrations, expressed as a percentage of the weight of the medium, of thanalith-U were found to be as follows for the six fungi: *L. trabea* 0·30, No. 517 0·20, *Lentinus lepideus* 0·12, *C. puteana* 0·04, *P. incrassata* 0·015, and *P. vaporaria* 0·01, the corresponding figures for triolith-U being 0·12, 0·16, 0·15, 0·015, 0·05, 0·015, respectively. These values are considered to be fully adequate for preservative purposes.

The chromium salt constituents of the preparations proved highly resistant to the severe leaching tests, the total amount lost in this way during a 53-day period being only about 1 per cent. The quantity of

arsenate leached out was about one-fifth, whereas the loss of sodium fluoride was rapid and substantial, involving 70 to 80 per cent. of the amount originally injected.

When the leached blocks were exposed to attack by the six above-mentioned fungi in Kolle flasks for four months, a high degree of resistance was shown, compared with the untreated controls, except to the arsenic-tolerant *Lenzites trabea* [ibid., xvii, p. 4], which attacked the thanalith-treated blocks about as severely as the controls.

RENNERFELT (E.). **Behandling av våt slipmassa med lignasan.** [The treatment of moist groundwood with lignasan.]—*Svensk Pappers-masse-Tidn.*, xvi, 3, pp. 51–52, 1939.

In the winter of 1938 lignasan [*R.A.M.*, xviii, p. 425] at rates of 200 and 500 gm. per ton of 50 per cent. dry pulp gave good control of blueing fungi [? *Phialophora fastigiata* and *Pullularia pullulans*] in Swedish factories [ibid., xviii, p. 774], the stock being protected over a period of eight months, during which the untreated check material sustained heavy damage. Experiments on a larger scale later in the same year gave promising results with smaller quantities (125 to 150 gm.) of the fungicide, which should be added to the riding roll of the wet machine rather than on the wire or at the first press. [An English abstract of this paper is published in *Paper Ind.*, xxi, 9, p. 1020, 1939.]

CUNNINGHAM (H. S.). **Vegetable seed treatment tests in New York.**—*Plant Dis. Reptr*, xxiii, 23, pp. 380–381, 1939. [Mimeographed.]

In order to test the value of the hot water seed treatment for the control of black rot (*Bacterium campestre*) [*Pseudomonas campestris*] on cauliflower [*R.A.M.*, xiii, p. 610 *et passim*] and other cultivated species of *Brassica*, the New York Farm Bureau in 1939 compared the development on agar plates of treated and untreated samples. Of 11 lots of untreated cauliflower seed, 5 were diseased, the corresponding figures for 23 of cabbage and 46 of Brussels sprouts being 11 and 27, respectively, whereas none of the treated samples showed any trace of infection. Similar results were obtained with the single lots of other *B.* spp. included in the trials. It thus appears that the regular use of the hot water seed treatment would eliminate this source of infection.

SEVERIN (H. H. P.). **Factors affecting curly-top infectivity of the Beet leafhopper Eutettix tenellus.**—*Hilgardia*, xii, 8, pp. 497–530, 4 pl., 1 fig., 1939.

Investigations carried out over a period of years in California to ascertain the percentage of beet leafhoppers (*Eutettix tenellus*) carrying infection by sugar beet curly top [*R.A.M.*, xviii, p. 225; xix, p. 1] in different areas and different years, and to analyse the factors concerned showed that in the Little Panoche Pass during five years when rain fell in November, inducing early germination of the seeds of pasture vegetation of the uncultivated plains and foothills, the infectivity of the spring generation of leafhoppers ranged from 16 to 42 per cent., while in two years when little rain fell until December or January the figures were 2 to 6 per cent.

A decrease was observed in the percentage of beets infected during

successive 30-day periods by adult hoppers maintained on plants immune from curly top and transferred singly to beets for one day. Many of the infective hoppers appeared to become unable to produce infection. The juices from the immune hosts did not seem to affect the period of infectivity and probably had no effect on the virus.

The additions reported in this paper bring the total number of plants shown to be naturally infected up to 75 species in 48 genera belonging to 18 families. Three species of perennials growing in uncultivated localities were naturally infected, but 16 species of perennials serving as food plants to the hoppers in dry autumns and early winters were not susceptible.

The virus was repeatedly recovered from *Atriplex fruticulosa* during a period of six months, and from *Chenopodium ambrosioides* during a period of one year. Natural infection of *Solanum douglasii* was observed during severe epidemics. The virus was recovered from naturally infected *Pelargonium hortorum* more frequently in spring than autumn. Perennial seedlings, such as *A. lentiformis* and *A. semibaccata*, were highly resistant. The virus was recovered from infected seedlings of *A. lentiformis*, but not from the same plants a year later. Seedlings of *A. semibaccata* were seldom infected, and large, old plants were immune; the virus was not recovered from one of three infected seedlings 23 days after its first recovery. The most favourable weed host virus reservoir was *A. bracteosa*, followed by *A. argentea* subsp. *expansa*, next by *A. rosea*, and lastly by *Salsola kali* var. *tenuifolia*, the virus being recovered from all the infected plants of the first three species, but 18·8 per cent. of the last-named were immune. The virus was transmitted to healthy beet seedlings by single hoppers and lots of ten reared on *Chenopodium murale*, *C. album*, *Suaeda moquini*, and *Rumex crispus*, which attenuate it. Adults reared on these same species inoculated with the virus frequently failed to recover it.

Roland (G.). **Onderzoekingen verricht in 1938 over de vergelingsziekte, de zwarte vlekken, de vorming van anthocyaan en de ontleding van zetmeel bij de Biet.** [Investigations conducted in 1938 on yellows, black spots, anthocyanin formation, and the estimation of starch in Beet.]—*Tijdschr. PlZiekt.*, xlv, 5, pp. 181–203, 1939. [French summary.]

The phytopathological studies included in this paper on beet investigations carried out at the Wageningen (Holland) Agricultural College in 1938 have been abstracted from other sources [*R.A.M.*, xix, pp. 185, 186], but the following additional points may be noted: beet yellows was also transmitted by the aphid *Aulacorthum solani* [? *Macrosiphum solanifolii*] to 16 out of 25 beets on which aphids had been placed for two days; and experimental evidence was obtained that anthocyanin development in Demi-Sucrière Géante Rouge Claudia beet was favoured by deficiency of potassium.

Stirrup (H. H.). **Violet root rot in Sugar Beet.**– *Brit. Sug. Beet Rev.*, xiii, 9, pp. 232–234, 2 figs., 1939.

Violet root rot (*Helicobasidium purpureum*) of sugar beets [*R.A.M.*,

xviii, p. 76, and above, p. 194] is stated to be prevalent in Lincolnshire and other parts of East Anglia, the average number of diseased roots passing an observer at a factory on several occasions being 60 in 20 minutes. A careful study during the last two years of the incidence and distribution of the rot showed it to be most abundant on limestone soils. In 1936 an analysis of the sugar content of infected roots immediately after lifting revealed a reduction of nearly 2 per cent., while in 1937 an increase was observed in the dirt tare (16 as compared with an average of 11 lb. per cwt.). Judging by the results of one experiment, the fungus does not appear to retain its viability after passage through the alimentary canal of sheep. The practice of using 'tailings' (small tails and lateral roots broken off in the washer at the factory) for manure should be discontinued as liable to perpetuate the fungus in the soil.

Proskura (S. S.). Вплив мідних добрив на урожай Цукрового Буряка на осушених торфових грунтах УРСС. [The effect of copper fertilizers on Sugar Beet yield on drained peat soils of the Ukrainian S.S.R.]—*J. Inst. Bot. Acad. Sci. Ukraine, 1939*, 21–22 (29–30), pp. 421–427, 1939. [English summary.]

In field experiments with sugar beet on drained peat soil (with a hydrogen ion concentration of P_H 8·2 to 8·3) in the Supoi Marsh, Soviet Ukraine, an increase in root yield of 3,270 and 5,845 kg. per hect. was obtained in 1937 and 1938, respectively, following a spring application of chalcopyrite [an ore containing sulphide of copper and iron] at a rate of 300 kg. per hect., the increase in the yield of sugar in 1937 being 718·5 kg. per hect. In another experiment carried out at the same place in 1938, a dressing of 450 kg. chalcopyrite per hect. resulted in an increased yield of sugar beet of 6,920 kg. It is concluded that the application of copper fertilizers is beneficial to sugar beet on drained marshes in the Ukraine; a dressing of chalcopyrite at the rate of 450 kg. per hect. is recommended in spring before the soil is prepared for sowing, or one of 300 kg. per hect. during the autumn ploughing.

Chamberlain (E. E.). **Varieties of garden and field Peas immune to Pea-mosaic.**—*N.Z.J. Sci. Tech.*, xxi A, 3, pp. 178–183, 1939.

Of 34 garden and 22 field pea varieties tested in 1936 and 1937 in New Zealand for their reaction to mosaic [*R.A.M.*, xvi, p. 512], using *Myzus persicae* as a vector (supplemented in a few instances by *Aphis rumicis*), twelve of the former and two of the latter group were immune, viz., Autocrat, Daisy, English Wonder, Greenfeast Rogue, Hundredfold, Little Marvel, Lord Chancellor, Lord Chancellor (Tare-leaf), Onward, Royal Salute, William Massey, and William Wonder (garden), and Black-eyed Susan and Mackay (field). An attempt is in progress at the Lincoln Division of Agronomy to develop a pea combining the desirable commercial qualities of Greenfeast with immunity from mosaic, Greenfeast Rogue being used as one of the parents in the crosses.

Virgin (W. J.) & Walker (J. C.). **Relation of temperature and moisture to near-wilt of Pea.**—*J. agric. Res.*, lix, 8, pp. 591–600, 1 fig., 1 graph, 1939.

In experiments conducted in Wisconsin, the causal fungus of 'near

wilt' of peas, *Fusarium oxysporum* f. 8 [*R.A.M.*, xix, p. 2], was grown in potato dextrose agar adjusted to P_H 6·2. The most rapid radial expansion of cultures occurred at 28° C. with an upper and a lower limit for growth at above 36° and below 8°. It was observed in both field and greenhouse trials that generally the symptoms of near wilt were slower to appear than those of wilt (*F. orthoceras* var. *pisi*) [loc. cit.]. The development of near wilt varied with the variety of peas, the disease appearing more quickly in early-blossoming varieties than in late-blossoming ones. In the greenhouse the disease was observed to develop most rapidly at soil temperatures of 24° to 28°, and nearly as rapidly at 20°, while at 16° the development was definitely retarded. Air temperature had little influence on the development of the disease. Pea varieties susceptible to near wilt wilted consistently most rapidly in moist soil, while there was little difference in the rate of wilting in dry and medium-moist soils; in resistant varieties the rate of wilting was distinctly higher in medium-moist soils than in the dry or the wet.

WALKER (J. C.) & MUSBACH (F. L.). **Effect of moisture, fertility, and fertilizer placement on root rot of canning Peas in Wisconsin.**—*J. agric. Res.*, lix, 8, pp. 579–590, 5 figs., 1939.

Marked control of root rot (*Aphanomyces euteiches*) [*R.A.M.*, xvi, p. 510; xix, p. 2] was obtained under greenhouse conditions in Wisconsin in three successive crops of Bruce, Alaska, and Surprise canning peas grown on Colby silt-loam soil receiving one application of 4-16-4 fertilizer at the rate of 500 lb. per acre; an average of 79 per cent. of plants was severely diseased in the unfertilized and only 19 per cent. in the fertilized soil. The effect of the fertilizer was more striking in dry than in moist soil, in accord with observations repeatedly made in central Wisconsin where the disease is rarely found in dry seasons and is usually very destructive in moist ones.

In field experiments conducted on various silt and clay-loam soils in five localities with applications of 2-12-6 and 0-20-10 fertilizers at the rate of 200 or 300 lb. per acre, the greatest increases in yield over the control were obtained when the fertilizer was applied down the same drill spout with the seed, the increase averaging 13·7 to 22·2 per cent. in the non-infested soil, and 46 to 248 per cent. in root rot-infested soils. When the fertilizer was applied about $1\frac{1}{2}$ in. to the side of and at the same level as the seed the yield increased by an average of less than 10 per cent. in the non-infested soil, and varied from a decrease of 14 to an increase of 68 per cent. in infested soil. It appears that quickly available nutrients placed where root development occurs in its early stage enable the plant to build up a greater resistance to the invading root-rot organism. The reduction of root rot and the increases in yield were much greater in plots receiving 2 per cent. readily available nitrogen in the fertilizer than in those from which it was omitted.

WIANT (J. S.). **Species of Phytophthora responsible for market decay of Western Honey Dew Melons and Cantaloups.**—*Plant Dis. Reptr*, xxiii, 19, p. 322, 1939. [Mimeographed.]

All but one of eleven representative isolates of *Phytophthora* from

decaying Honey Dew melons and cantaloupes on the New York market in September, 1938, were determined as *P. capsici* [*R.A.M.*, xvii, p. 157]. One isolate from a cantaloupe from Green River, Utah, was found to be *P. cactorum*.

TEHON (L. R.) & BOEWE (G. H.). **Charcoal rot in Illinois.**—*Plant Dis. Reptr*, xxiii, 19, pp. 312–325, 5 maps, 1939. [Mimeographed.]

Macrophomina phaseoli, first recorded in Illinois in 1926 by G. L. Stout on cowpea [*R.A.M.*, xiv, pp. 208, 670], has since been found 51 times on various wild and cultivated hosts in the same State, including soybean, Korean *Lespedeza*, maize, hemp, *Erigeron canadensis*, *Lactuca scariola*, and *Abutilon theophrasti*. The fungus appears to be almost ubiquitous in the soils of the State, but no evidence has so far been found of strains with specific host preferences. Only one specimen found in Illinois, that collected on cowpea in Jefferson County in 1931, has shown both pycnidia and sclerotia, from which it is concluded that under the local climatic conditions reproduction normally occurs by means of sclerotia, unless a number of collections on cowpea, tentatively identified as *Macrophoma subconica* Ellis & Everh., which bear no sclerotia, should prove to be the pycnidial stage.

Measurements of sclerotia in infected tissues of eight species of plants in Illinois were all, in their means, under the minimum of 120 μ permitted for inclusion in Haigh's group C [ibid., ix, p. 685], indicating their similarity in respect of size to the fungi recorded from other areas as *Macrophomina phaseoli*.

AJROLDI (P.). **Il mosaico del Peperone.** [Chilli mosaic.]—*Riv. Pat. veg.*, xxix, 9–10, pp. 399–422, 10 figs., 1939.

During the past seven or eight years, chilli (*Capsicum annuum*) mosaic [cf. *R.A.M.*, xvi, p. 154] (not previously recorded from Italy, and apparently the same as the disease reported from Spain in 1934 as 'niebla nueva' [ibid., xiii, p. 744]) has become progressively more widespread and severe in the vicinity of Milan, where in some plantings losses of 50 to 70 per cent. are now common.

The first symptoms appear about 30 to 60 (occasionally up to 100) days after transplanting into the field. Large-fruited varieties may show either of two types of mosaic, 'typical aucuba' or 'typical marbling'. The former consists in chlorotic spots often merging into irregular, white to yellowish areas with a darker edge, generally confined to the leaf apex and margins, though sometimes the discoloured parts appear as alternate light and dark concentric rings. In the 'marbling type' the spots are arranged in serpentine lines, frequently starting near the leaf stalk, and discoloration is most uniform and constant near the veins.

Both types of symptoms are accompanied by fleshy, leathery leaf swellings and leaf malformation. Spots are sometimes present on the leaf stalks and young shoots. The symptoms first develop on the youngest leaves, and become progressively more marked until, in some instances, the entire plant appears abnormal within a fortnight. Growth is arrested and even from a distance the affected plants appear pinched, rachitic, and sickly. The crop is reduced to the few fruits that have set

before the onset of the condition, fruits developing later being dwarfed and misshapen. Medium- and small-fruited varieties suffer much less damage as they have completed their growth when attacked. Plants grown wholly or partly under glass are seldom affected.

Histological examination of healthy and mosaic leaves showed that in the latter the palisade cells are isodiametrical, irregular, and often arranged in two or more superimposed layers. The lacunar tissue appears as if parenchymatous. The chloroplasts are less numerous than is normal, arranged in an irregular mass, and poor in chlorophyll pigment. X-bodies are present. In fresh material the mosaic parts of the leaf are thicker than the healthy part.

When healthy chilli plants were inoculated with juice expressed from mosaic chilli plants by rubbing the leaves with cotton wool, pricking the stem and leaf stalks with a lancet, and inserting cotton plugs in the stem, leaf stalks, and shoots, symptoms of chlorosis appeared on 12 out of 90 plants in 15 to 25 days, the symptoms later becoming identical with those observed in the field. Similar inoculation tests on *Solanum nigrum* gave symptoms of 'aucuba mosaic' after 20 days, but negative results were obtained on tomato and potato. Very young chilli plants were shown to be much more susceptible than older plants.

The available evidence strongly suggested that the disease is soil-borne and is favoured by sudden changes in temperature during the night, heavy applications of nitrogenous mineral fertilizers, especially at transplanting, and frequent irrigations with cold water. Control must be sought chiefly in the selection of resistant strains.

HARRIS (M. R.). **A survey of the spotted wilt disease of Lettuce in the Salinas Valley.**—*Bull. Dep. Agric. Calif.*, xxviii, 3, pp. 201–213, 3 figs., 1939.

Since 1935 spotted wilt of lettuce [*R.A.M.*, xvi, pp. 321, 502; xviii, p. 235] has become progressively more destructive in the Salinas Valley, California. In fields formerly unaffected a slight loss is now experienced early in the summer, and as the season advances this loss rapidly increases, until by the beginning of autumn or before, the loss in some plantings amounts to over three-fourths of the crop. As far as is known at present, the only insect vectors found locally are *Thrips tabaci* and *Frankliniella* sp. These are present in large numbers towards the end of summer, but the insect population becomes much reduced when the rains begin. In exceptionally warm years they may be found at all seasons in the open fields.

A survey for weed hosts in January, 1938, showed spotted wilt symptoms present only on an occasional old *Malva* plant. The disease was, however, found on nasturtiums [*Tropaeolum majus*], dahlias, asters, *Zinnia*, *Begonia*, Calla lilies [*Zantedeschia aethiopica*], sweet peas, *Petunia*, tomatoes, peppers [*Capsicum annuum*], endives, broad beans, celery, and peas.

The disease on lettuce was found to appear gradually as spring advanced in fields adjacent to those lightly infected in the preceding winter and in others near localities where perennial hosts had harboured the virus during the winter. Spread extended in all directions from an initial infection, but was very marked away from the direction of the

prevailing wind. Where old lettuce fields were infected and allowed to stand over winter, adjacent young lettuce fields became much more heavily infected in early spring. As the season progressed, lettuces near such sources of winter carry-over were much more heavily infected than lettuces in other places where old, diseased lettuce plants were not allowed to grow through the winter.

For control purposes, the lettuce fields should be ploughed as soon as harvested, ornamental hosts should be removed, cultivation should be practised as far as possible in localities not showing appreciable infection, lettuces should not be planted close to peppers or tomatoes if the lettuces are to be harvested in summer or autumn, and should not be planted in summer or autumn in places adjacent to those used for seed production of ornamental hosts, and old *Malva* plants should be destroyed.

MORSE (W. J.) & CARTTER (J. L.). **Soybeans : culture and varieties.**—*Fmrs' Bull. U.S. Dep. Agric.* 1520, 39 pp., 9 figs., 1 map, 1939.

In the part of this popular leaflet dealing with diseases of the soy-bean the following are discussed. Purple spot of soy-bean seed, ascribed by Japanese investigators to *Fusarium*, *Cercosporina* [*R.A.M.*, ix, p. 23] or physiological factors but the cause of which seems to be still uncertain, has been observed to occur during seasons when rainfall was above normal at the time the seed was maturing, while in normal seasons plants grown from seeds with purple spot showed no signs of disease. The blight diseases caused by *Bacterium glycineum* [ibid., xviii, p. 413] and *Bact. sojae* [ibid., xix, p. 192] are stated to resemble each other so closely that their differentiation in the field is doubtful; mosaic [ibid., xviii, p. 608] was found to be seed-borne, the virus remaining viable in seed after two years; wilt (*F. bulbigenum* var. *tracheiphilum*) [ibid., xvi, p. 585] is most severe on coarse, sandy soils; brown spot disease (*Septoria glycines*) [loc. cit.] may possibly be seed-borne; sunburn or aphid injury is associated with *Alternaria atrans* as a secondary invader; *Peronospora sojae* [ibid., v, p. 471] is widely spread in the United States but has not been serious in any locality; a pod and stem blight caused by *Diaporthe sojae* [ibid., xiii, p. 270] is reported from North Carolina, Indiana, and Delaware; and considerable injury was caused during the summer of 1937 by anthracnose (*Glomerella glycines*) [ibid., vi, p. 75] and stem rot (*Sclerotium rolfsii*) [ibid., xvi, p. 585]. Other diseases listed are bacterial pustule (*Bact. phaseoli* var. *sojense*) [ibid., xviii, p. 379], frog eye leaf spot (*Cercospora daizu*) [ibid., xvi, p. 492], and root rot (*Pythium de Baryanum*) [ibid., vi, p. 75].

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xiii, 12, p. 294, 1939.

ARGENTINE REPUBLIC. By Decree No. 31,849 of 26 May, 1939, plants, cuttings, and young fruits of certain [specified] genera of Rosaceae susceptible to fireblight (*Erwinia amylovora*), as well as sugar-cane plants and cuttings, before introduction into the Argentine Republic must be placed in quarantine for a period of observation to be determined in each case, even though the consignment is accompanied by a health certificate.